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ABSTRACT

The first of a two-part series, this volume addresses the broad scope of questions and issues that confront local governments when formulating or reevaluating cable policy. In 11 chapters, 14 authors present an historical perspective and discuss cable technology and state-of-the-art options: (1) "Overview of Cable TV Services and Technology," Nancy J. Jesuale and Ralph Lee Smith; (2) "Cable System Revenues and Expenses," Deborah Love-Heilig; (3) "Enhanced and Interactive Services," Janet L. Quigley; (4) "Security and Fire Alarm Services," John Mansell; (5) "Institutional Networks," Thomas E. Wolfsohn; (6) "Community Programming: Public Access and Local Origination," Susan Bednarczyk, Tom Borrup, Janet Quigley, and Margaret Shulz; (7) "Local Government Uses of Cable," John Velie; (8) "Educational Uses of Cable," Carol Brown Eilber; (9) "Health Uses of Cable," Charlotte A. Bliss; (10) "Telecommunications Needs Assessments," Harriet Moss; and (11) "Vital Links-- Interconnection of Cable Systems," Linda J. Camp. Appended materials include "Elements of Community Television Production," John Velie; "Glossary of Cable Terms," Lonni Moffet; "Bibliography," Reed Carpenter; and "Satellite Program Services" (a listing). Diagrams and tables of data are included in various chapters. (LMM)

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CTIC
Cablebooks

Volume 1:
The Community Medium

Edited by Nancy Jesuale with Ralph Lee Smith

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This book evolved even as we worked on it. It was written by several authors, most of whom had no chance to see the others' work. The editors have attempted to work all of the sections into a whole that is intended to inform while remaining neutral on many issues. As such, however, there are rough spots. Even as we completed a section, a new bill or Court decision would alter the facts or our views on an issue. There are bound to be inaccuracies, especially as the volume ages and any mistakes or inaccuracies are only the fault of the editors.

Nancy J. Jesuale

About the Authors

This volume would not have been possible without the cooperation and contributions of the 14 authors who shared their expertise in cable television policy issues. The editors gratefully acknowlege their work on this volume.

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The editors gratefully acknowledge the contributions and cooperation of all who wrote for this volume and who advised on its content. We also express our thanks to the authors of the original series of publications for local decisionmakers on cable published by The Cable Television Information Center in the early 1970's, for their pioneering work and lasting comments in the field which have been of so much assistance in this effort.

Individually, we wish to thank Naomi Howe, Sue Ann Wall, and Jamie Figuera for their tireless and accurate work to produce this volume, and Karen Shannon for her expert advice and design of its pages.

We also thank the National Cable Television Association, the National League of Cities, the Cities of St. Paul and Minneapolis and Paul Kagan's *Cable TV Security* Newsletter for supplying documents for reference or reprint.

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Foreword

The need of local decisionmakers for education and information services relating to cable television has increased significantly in recent years. Two developments in the cable environment are primarily responsible for creating this need. First, the virtual explosion of available cable services—such as two-way interactive systems, institutional networks, information retrieval services, home security systems, satellite services, and access channels dedicated to community use—has multiplied the number of public service options a local government must scrutinize, both before granting a cable franchise, during the franchise period, and while the agreement is in effect. Secondly, the decreasing Federal role in cable regulation, the FCC deregulatory stance, and recent court decisions have shifted the primary burden of regulating cable to local governments themselves.

These developments have had the effect of greatly expanding the local government role in dealing with cable and have created greater public interest and involvement in the quality of a community's cable service. The impact of local involvement and the local regulatory role has been greatly increased for the local official.

The Center's experience has shown that those local governments who are most prepared are able to negotiate the most beneficial services and terms from their franchisees, as well as being better equipped to manage the franchise during its term. A badly negotiated and regulated franchise can deprive all citizens of good cable services.

The "Wiring of America" has greatly accelerated in the last 2 years. Most of the major urban areas have only recently completed the franchising process and are currently under initial construction. Hundreds of older "cabled" communities are in the process of renegotiating franchises and are expanding the local system's capacity and technical capabilities.

As energy, transportation, housing, and postal costs rise, cable will become even more of a central factor in our lives as it presents yet another option to lowering these costs and raising the standard of living in a community.

The Cable Television Information Center, which has assisted 2,500 local governments with cable related issues over the last 10 years, has attempted in these volumes to address the broad scope of questions and issues that confront a local government when formulating or reevaluating cable policy. These books are the result of our involvement with local officials who have successfully addressed the touchy issues of regulatory policies, privacy, censorship, local ownership, free ("universal") service, citizen access to the system, educational uses, and much more. It is our desire in disseminating these books to further contribute to better understanding of the impact that cable television has for local government regulators and to convey the potential impact that cable presents upon the quality of life in their communities. The *CTIC Cablebooks* were funded by a grant from the John and Mary R. Markle Foundation for this purpose.

The books are organized into two separate volumes. The first volume, *The Community Medium,* discusses cable technology and services and presents a historical perspective and a full discussion of state-of-the-art options. Volume II, *A Guide For Local Policy,* develops many of the most pressing cable policy issues facing local governments, describes alternative policy options, and suggests regulatory procedures successfully used by decisionmakers across the country. Both books contain useful appendices for reference and clarification.

We here at the Center are again indebted to the John and Mary R. Markle Foundation for their continuing assistance over our 10 year life in making an extensive series of publications available to local officials and all persons concerned with

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keeping informed on this fast changing technology.

The Director of Public Information for The Cable Television Information Center, Nancy Jesuale, and the many contributing authors and editors should be proud of the contribution they have made with these two additional and very timely publications.

Harold E. Horn
President
The Cable Television Information Center

1

Overview Of Cable TV Services And Technology

By
Nancy J. Jesuale
Ralph Lee Smith

Chapter 1: Overview of Cable TV Services and Technology

Cable television has become an object of fascination to millions of Americans. But to local government decisionmakers, cable television franchising and regulation have become major policy issues. Local governments and private citizens are beginning to realize that cable television means far more to a community than hundreds of entertainment channels. Cable is one part of a growing number of technologies that will bring the "information age" to a reality. As travel becomes more expensive, as consumers become more educated about computer and satellite technology, and as energy costs and efficiency become standards by which we measure our time and activities, all of us must come to grips with the potential effects of the increasingly "wired nation."

Cable television is a regulated industry. The frantic pace at which cable has been growing has caused Federal and local decisionmakers to seriously consider the public policy issues associated with its implementation: Is cable a monopoly? Should it be used to provide social services? How should it be regulated? Can it compete with other communications technologies? The answers to these questions are not easy to find. On both the Federal and local levels, our Nation's communications policy is in a state of flux. Policymakers are trying both to direct technology and to keep up with it.

In a way, the technological explosion of which cable television is only a part can be likened to the advent of the printing press. For the first time, Gutenberg made it possible for all people to learn to read, write, and share information. The information age, in which cable connects to computers, satellites, databases, and telephones, may allow us all to make a quantum leap in the amount of information we can access and the knowledge we can gain.

This set of handbooks comes at a time when so little information is available about cable that it tends to be viewed as a novelty, a toy, or merely as a source of entertainment. Many decisionmakers, entrepreneurs, and technologists, however, believe that cable is no more a toy than the first rocket. It is instead, a profound new electronic highway that sends and delivers a diverse and expanded universe of information and images.

These volumes are intended to help policymakers and consumers understand cable television's uses, its operation, and the policy issues it presents.

Cable Television Services

Cable television began as a retransmission service; that is, it brought better reception of over-the-air broadcast television signals to communities that did not experience clear reception. When the Federal Communications

Commission (FCC) began to regulate cable television, it considered an "ancillary service to broadcasting." Thus, the FCC requires cable operators to transmit all local broadcasting stations and any "significantly viewed stations," including network affiliates, independent stations, and educational stations located within a certain radius of a community. Usually, in 12-channel cable systems, these "must-carry" rules require operators to fill most of their usable channels with local signals. A few channels are usually left over, however, that can be used for other types of services. In systems with 20, 35, 54, or 100 or more channels, the services beyond retransmission of broadcast signals are the economic backbone of cable service.

Basic Service

Basic service generally refers to cable services available to the subscriber for one monthly fee. Basic service packages can differ for each cable system. In systems with a large channel capacity (35 channels or more), several "tiers" of basic service are often available, each offering more services for slightly higher monthly fees. Basic service always includes the must-carry signals and often also includes community programming channels and some satellite-delivered programming.

Community programming is described in greater detail later in this volume. Generally, this term refers to two broad types of community programming: access and local origination. Access programming is produced and controlled by some community entity besides the cable operator, who simply makes facilities and channel space available for its transmission. Local origination, on the other hand, is operator-sponsored community programming and is usually more commercial than access programming. Both types of community programming, however, are uniquely local, and for the most part are carried only on the local cable system. This type of programming is distinct from broadcasting in that no one but cable subscribers can receive it and that it is designed to be of special interest to the community.

Satellite-delivered basic services differ from pay TV in that the subscriber does not pay extra to receive them. Many types of satellite services are available to cable operators, and analysts expect even more to appear in the next few years. Satellite program services will face tremendous competition for space even on systems with more than 100 channels.

Satellite-delivered basic services include cable news networks, arts and cultural services, religious programming, children's channels, sports channels, newswire services, public service networks, congressional coverage, weather, services, and "superstations." Superstations are conventional broadcast stations that use satellites to disseminate their signals far beyond their local coverage area. Superstations are available to local cable systems from Atlanta, New York, and Chicago. (A complete listing of satellite-delivered programming available to cable systems appears in appendix 2.)

Pay Programming

Pay programming describes services available to the subscriber for an additional fee over the basic rate. Currently, there are two categories of pay TV: channels available for an additional fee, and "pay-per-view" programs, in which the operator charges the subscriber per program rather than per channel. Perhaps the best-known pay services are the movie channels, which usually offer uncut first-run movies 24 hours a day. The subscriber pays anywhere from $6.50 to $10 per channel for each pay TV service. Pay channels have also been formed to deliver Broadway musicals and other cultural programs, sports, foreign language channels, family entertainment, and adult movies. Some pay channels are considered "maxi-pays" in that they offer more hours of programming for a higher fee, and some are called "mini-pays," which usually offer fewer hours of family-oriented entertainment for a lower rate. Most pay programming is delivered to the cable system by satellite.

Pay-per-view services are a relatively new. The operator usually advertises the program, such as a championship fight or a rock concert, to subscribers. To view the program, the subscriber places an order with the operator on a program-by-program basis. Only households that have requested the program will be able to see it; the signal is "scrambled" or "trapped" to all other homes.

Enhanced and Interactive Services

Some new cable television services use the inherent capacity of coaxial wire to deliver "nonentertainment" services to subscribers. Shop at home, bank at home, home security, videotex, teletext, and subscriber polling services are a few examples of the new enhanced services currently under development in the cable industry. Videotex and teletext services allow the subscriber to access databases that contain information on a variety of subjects, from stock market prices to library catalogs. Teletext is a one-way service, which allows subscribers to "grab" information off a carousel of text pages transmitted through the system. Videotex is a two-way system in which the subscriber keys in a specific request for information that the computer then transmits individually. The following chapters describe these and other cable television services and technology in detail.

A Cable Technology Primer

At the heart of cable technology is the cable itself. Coaxial cable looks, in cross-section, like a pencil. In the center is a copper or copper-clad wire. This wire is surrounded by an insulating layer of polyethylene foam, analogous to the wooden cylinder of the pencil. This layer of insulation is surrounded by an aluminum tubular shielding. The entire cable is sheathed in a rubberized outer casing.

When an electronic current is introduced into the cable, the copper

wire in the center and the outside shielding react electronically with each other, setting up a magnetic field between them. This field inhibits frequency loss and is the key to cable's immense carrying capacity.

Telephone lines also carry electronic information into the home. However, the pair of wires that deliver telephone service do not create between them a magnetic field of the type generated in a coaxial cable, and their carrying capacity is therefore a tiny fraction of that of coaxial cable.

Bandwidth Channel Capacity

Carrying capacity is expressed in bandwidth, which means the amount of frequency spectrum that the system can accommodate to transmit signals. Bandwidth, in turn, is expressed in cycles per second, called hertz.

The amount of bandwidth required to transmit television pictures is much greater than the amount required to carry either voice or data. The ordinary home telephone provides clearly intelligible voice transmission with a bandwidth of about three kilohertz.[1] In contrast, a bandwidth of six megahertz is required to transmit a single television picture—2,000 times as much bandwidth as is used to transmit the human voice by telephone.

The term "broadband" is used to describe technologies that can transmit a broad frequency spectrum. As such, they can carry moving television (video) pictures as well as voice and data. Broadband technologies include over-the-air TV broadcasting, cable satellite, microwave, and fiber optics. "Narrowband" technologies have a more limited frequency range. They can transmit nonvisual material such as voice and data but cannot transmit moving video pictures.

Cable systems being built in major cities and metropolitan areas are often dual-cable facilities; that is, two cables are laid side by side. The carrying capacity of these cables is a function of the associated hardware and various technological considerations. The latest generation of hardware offers some 440 MHz of bandwidth with a practical carrying capacity of 50 to 54 television channels. A dual cable facility would thus provide total capacity of slightly more than 100 television channels. Dedicating even a modest amount of such capacity to date or voice transmission would provide immense capacity for this type of transmission because data and voice use only a fraction of the frequency space that television signals require.

Cable System Components

Cable systems have a facility called the *headend* that receives all of the system's programming from various sources, including standard over-the-air TV and radio signals, distant TV and radio signals microwaved to

[1]One hertz (Hz) is a frequency of one cycle per second.
One kilohertz (kHz) is one thousand hertz.
One megahertz (MHz) is one million hertz.
One gigahertz (GHz) is one billion hertz.

the headend, satellite transmission, videotapes, and material originated in the cable company's local studio. At the headend, signals are amplified and processed, assigned to frequencies on the cable, and transmitted over the cable to the subscribers.

The cable runs through the community on poles or in underground conduit space leased from the telephone or the electric company. The main cable is called the *trunk*. Smaller diameter cable, called *feeder* cable, carries the signals from the trunk into local areas and neighborhoods. *Drop* cables, of yet smaller diameter, run from the feeder cable to individual homes. *See Figure 1-1.*

From the time that the signals leave the headend, they lose quality and strength as they pass down the cable. *Amplifiers* must be placed at regular intervals along the cable, at spacings of one or two per mile, to bring the signal back up to strength. These amplifiers cannot, however, restore any quality that the signals have lost, and in fact contribute to the degradation of the quality of the signal because passage through any electronic device has a slightly deleterious effect on signal quality. The numerous tapoffs from the feeder cables to subscriber homes also adversely affect the quality of the signals that pass beyond each tapoff to homes farther down

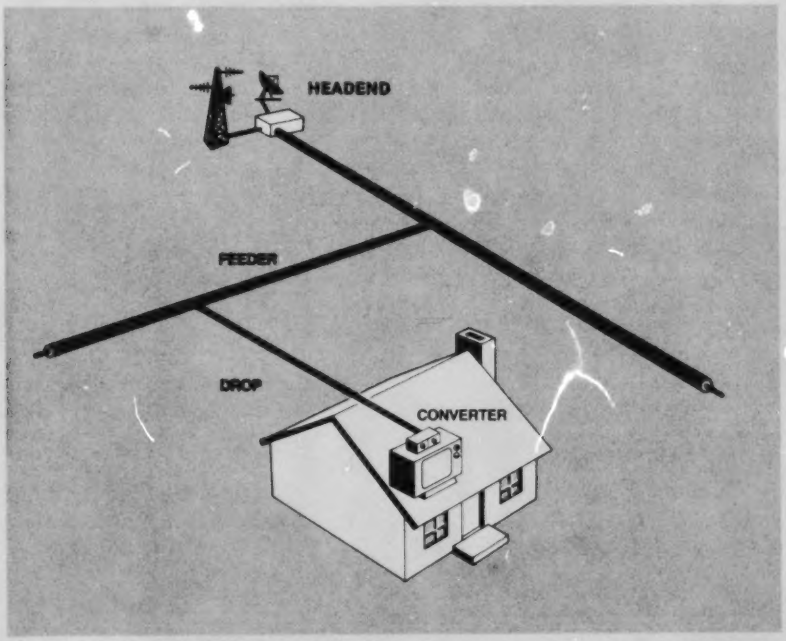

Figure 1-1 Typical Cable System Configuration

the line. These considerations place a maximum limit of about eight to ten miles on the distance that the cable can travel to a subscriber, and still transmit pictures of good quality.

Many franchised jurisdictions, of course, have areas that exceed the maximum good signal reach of the cable. This problem is solved by creating a number of hubs, or sub-headends, each serving subscribers for a maximum of some eight to ten miles. The hubs are connected to the main headend by a direct cable ("super trunk"), which, because it is not branched or tapped, transmits the signals from the headend to the hub with little loss of quality. *See Figure 1-2.* In some instances, the hubs are connected to the headend by microwave. *See Figure 1-3.*

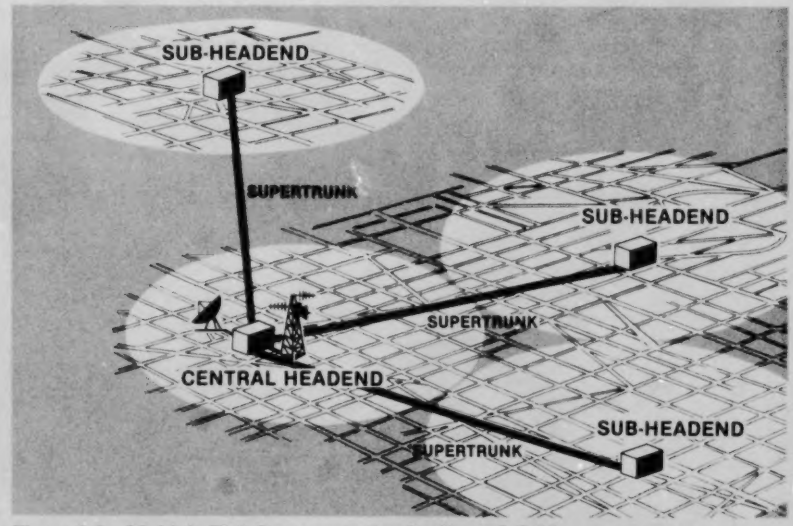

Figure 1-2 Multiple Hub Interconnection by Coaxial Cable

Microwave

Microwave is a special radio frequency set aside by the FCC for closed communications. Often cable operators use microwave rather than trunk cable to traverse long distances. Microwave is often more economical than coaxial cable for extending the coverage area of a system. The cable system signal is beamed via a microwave transmitting antenna to a corresponding microwave receiver and passed along the cable system from the receiving end. Thus, in a hub system, microwave may be used to interconnect the hubs of a system. However, microwave technology is useful only where "line-of-sight" transmitting can be achieved. This is because radio frequency travels in a straight path through the air and is therefore useless

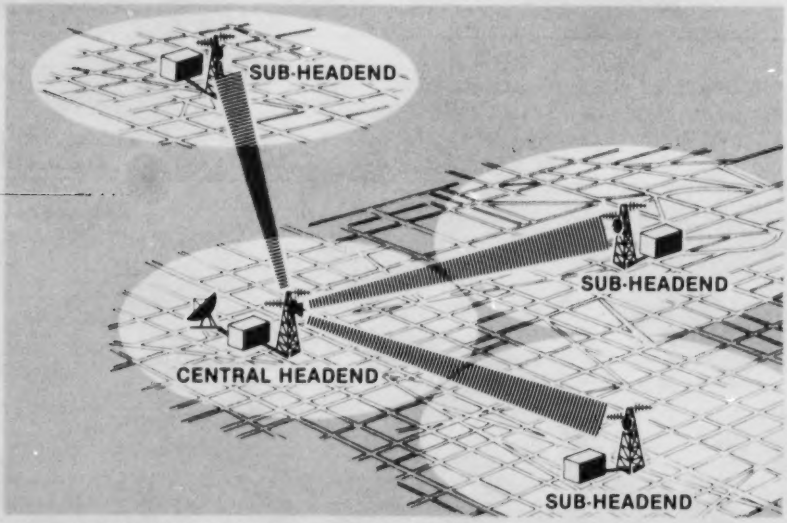

Figure 1-3 Multiple Hub Interconnection by Microwave

where tall buildings, hills, or other obstructions may block the transmission path.

Microwave has also been used to deliver premium or other programming services on a regional basis or in conjunction with satellite technology. The use of microwave to send and receive signals usually depends on the number of channels to be transmitted (microwave has a much more limited channel capacity than does cable), the distance to be traveled, any obstructions, and relative costs. Microwave is more feasible than cable where a long hop is necessary, and line-of-sight transmission can be be achieved.

Channel Layout for the Subscriber Network

In a subscriber network cable that can transmit 50 to 55 channels of TV, most of the capacity is usually dedicated to "downstream" transmission from the headend to the subscriber. In modern two-way systems, however, a small portion of the spectrum in the "low-band" range—about 5 to 30 MHz—is usually reserved for "upstream" transmission, from various locales around the community to the headend.

This portion of the spectrum does not provide the highest quality transmission and is subject to interference from citizens' band (CB) and amateur radio signals, which transmit in the same frequency range. Still, several usable video channels, plus a large number of usable voice and data channels, usually can be transmitted on the low-band cable frequencies. The video channels are often used to transmit material from selected fixed sites, such as libraries, community-based access studios, or college and university

studios, to the headend for live retransmission downstream on the subscriber network.

In a dual cable system providing 100 to 105 channels, both cables usually provide for upstream transmission in the 5 to 30 MHz range, thereby doubling the number of available upstream video, voice, and data channels. *See Figure 1-4.*

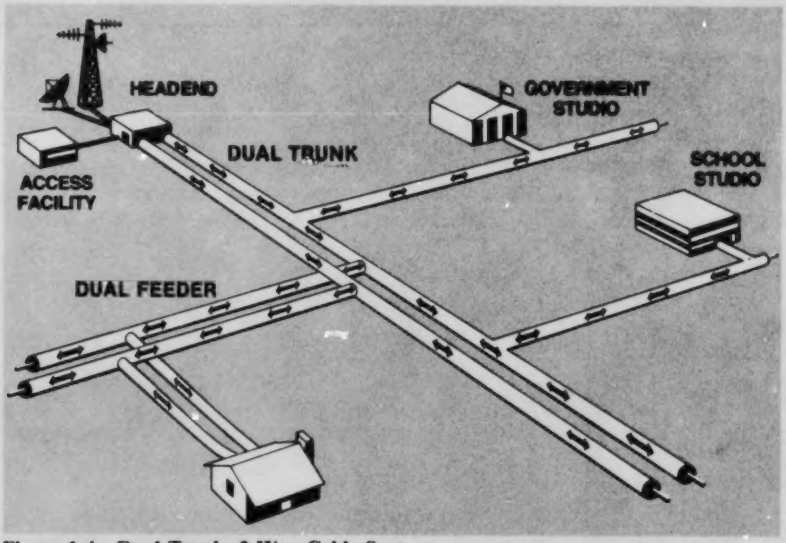

Figure 1-4 Dual Trunk, 2-Way Cable System

Converters, Addressable Converters, and Computer-Controlled Systems

Most cable systems built in the 1950's and 1960's had a capacity of 12 channels. These channels were transmitted downstream to subscribers on the same frequencies as the 12 channels that standard home TV sets are designed to receive.

With the advent of cable systems with higher transmission capacities, cable operators had to provide subscribers with devices called *converters* to enable them to receive the additional channels. Up to 24 channels could be accommodated by a converter often called an "A-B switch," providing the subscriber with two sets of 12 channels that could be tuned by a television receiver. To receive more than 24 channels requires increasingly sophisticated and costly converter technology.

Addressable converters, which are now being offered in many or most franchise bids in urban centers and metropolitan areas, represent a further advance in system sophistication. In a cable system with addressable converters, a computer at the system's headend controls the operation of the system and the delivery of services. The computer knows the electronic

"address" of each subscriber and can deliver premium programming and other special services according to subscriber requests. Subscribers can add or drop premium services by pushing a button, and the cable operator can terminate services immediately for nonpayment of bills.

Addressable systems also make it possible to assemble audiences, one by one, for "pay-per-view" offerings such as college courses, sports, entertainment, and cultural events.

Interactive or "Two-Way" Systems

Interactive or "two-way" systems are capable of two-way transmission—downstream from headend to subscriber, and upstream from subscriber to headend. Such transmission requires the installation of two-way amplifiers. Two-way amplifiers contain two amplifiers in each housing, one for transmission downstream and one for return signals originating at various points on the subscriber network and moving toward the headend.

One type of interactive transmission involves transmitting video from various sites in the community upstream to the headend. At the headend, these signals are converted to a higher frequency and retransmitted downstream to all subscribers.

Other types of interactive service allows each subscribing household to transmit a small amount of nonvisual electronic information back to the headend. This capability is involved in home burglar and fire alarm systems, described in chapter 4. When sensors in the home are activated, the information reaches the computer at the cable headend, which "knows" which subscribing home originated the signal.

Other services requiring upstream transmission capability from subscriber homes to the headend include polling, shopping, and banking at home, and access to computerized data and information—the "home information center"—all of which are described in chapter 3.

Addressable converters are not necessarily interactive, however. They can permit computerized control of the reception of premium channels and pay-per-view material from the headend without providing any return transmission capability from the home. As with all increments in sophistication and capability, interactive addressable converters cost significantly more than one-way addressable converters. At this writing, addressable converters that can send nonvisual signals from each subscriber's home back to the headend, cost about $250 each. Placing such devices in subscribers' homes is a major cost for cable operators.

Two-way addressable converters typically have a numeric keypad similar to that on a pocket calculator and several buttons for registering responses to opinion polls.

The numeric keypad is a satisfactory means for participating in interactive services such as banking and shopping at home and is probably good for accessing some forms of computerized data. It is less satisfactory, however, for accessing data in computerized data banks that have set up to

interface with home computers and other devices with alphanumeric keyboards. To some extent, a gap exists between the costliest device that cable systems can reasonably be expected to install in homes and the least costly way to access many forms of computerized data. The use of data banks, numeric keypad converters, and home computers is an area of cable technology that has barely begun to be explored at this writing.

Data Transmission

Over-the-air TV and most voice telephone service are transmitted in an electronic fashion known as analog. Virtually all data transmission, however, is in digital form. Digitalization is the "wave of the future" for many other types of transmission. For example, all satellite TV transmission is digital, parts of the telephone system have been digitalized, and the entire telephone network will ultimately be digital.

In analog transmission, the sound or video waves are converted into analogous electrical waves for transmission through a wire or over the electromagnetic spectrum. At the receiving end, these waves are converted back into the pictures or voice communications of which they are an electronic representation.

In digital transmission, the information being communicated—voice, data, facsimile, or visual images—is encoded in a binary system that recognizes only the values of zero and one. The signal is "sampled" millions of times per second, and those "sample reports" constitute the transmission. At the receiving end the samples are used to reconstruct the signal.

Digital transmission requires more bandwidth than analog transmission. It has, however, important advantages, most of which relate to signal fidelity. If "pieces" of an analog signal are lost in transmission, the result is an inferior signal at the receiving end. If a few samples of a digitalized signal are lost, however, there is virtually no impact on the reconstruction of a highly accurate reproduction of the original signal at the receiving end. "Error rates" for digital transmission are thus far lower than for analog transmission, and this is an important consideration for data transmission.

Speed of transmission on a digital system is measured in bits per second (b/s). A bit is the smallest unit of information in a digital system. The greater the speed of digital transmission, the more bandwidth is required. The telephone network, which is a satisfactory carrier of data at low to medium transmission speeds, cannot accommodate high speed transmission.[1]

This fact has given rise to what is often called the "last-mile" problem. High-speed data can be sent coast to coast through the broadband facilities of communications satellites but often encounter formidable

[1]The telephone network can accommodate speeds up to 9,600 bits per second, which is regarded as medium speed, without difficulty. But higher speeds, for example, 56,000 bits per second, a standard speed for data transmission, are beyond the telephone system's delivery capability.

obstacles in traveling from the receiving earth station to destinations a short distance away. Cable systems offer the potential for solving the last mile problem by offering a broadband facility with adequate bandwidth for any speed of data transmission within the area covered by the cable.

Institutional Networks

In modern cable systems, functions such as data transmission between and among municipal agencies are usually assigned to a separate facility called the *institutional network*. As noted in chapter 5, such networks are a relatively recent feature of franchise bids. Several studies on municipal telecommunications, however, have indicated that the institutional network will be a valuable telecommunications facility for both public sector and commercial users. Institutional networks differ from subscriber networks in several respects.

First, they interconnect only a specified, limited number of users. In the public sector, drops to the institutional network are usually offered to city administrative offices; to city departments and agencies such as police, fire, traffic, health, and social services; to libraries and public schools; and to colleges, both public and private.

Second, the capacity of the institutional network is often split fairly evenly, with approximately the same capacity for transmission in one direction as in the other. A typical configuration will offer several channels each way.

Third, much of the transmission that passes over the institutional network is created or introduced into the cable by the users rather than by the cable operator and is primarily intended for reception by other users. The institutional network is rarely involved with entertainment television programming. The video it is likely to carry includes videoconferencing and training and educational materials for public employees. Nonvideo transmission, particularly data but also some voice traffic, will represent a far greater portion of communications traffic on the institutional network.

On an institutional network, transmission from one user to one or more recipients on the network requires two channels. The sender transmits a message to the cable headend on one of the lower frequency channels. The message is switched at the headend to one of the higher frequencies and is then retransmitted downstream to the intended recipient or recipients.

For voice and data transmission, the capacity of an institutional network cable is more than sufficient for any foreseeable amount of traffic that a municipality could generate. Video transmission, involving the use of two channels for every transmission, has obvious limits, although these limits do not appear to pose serious problems for cities in the near future.

Some material originating on an institutional network may be of general interest to the community. Such material, when it reaches the headend, can be switched onto a channel on the subscriber network as well as to other recipients on the institutional network. For example, a school

play can be transmitted to all schools on the institutional network and to the entire community on the subscriber network. In short, an institutional network is likely to be of interest and value to certain commercial users as well as to public and municipal users.

Fiber Optics

Fiber optics is an alternative technology to coaxial cable. It transmits electronic communications via a beam of light from a laser source. The laser light, carrying signals, travels along a glass fiber about the size of a human hair. This technology provides great purity and fidelity of transmission and offers a bandwidth that is potentially much greater than that of coaxial cable. In addition, the glass fiber is smaller and lighter than coaxial cable and is virtually immune from interference with signals from citizens' band and amateur radio signals, a problem that sometimes occurs in coaxial cable installations. With present technology, a single glass fiber can accommodate 100 television channels; this capacity will increase as laser light sources are improved.

Fiber optics is an increasingly viable technology for high-capacity, point-to-point transmission that does not involve branching, taps, or dropoffs. Its principal limitation at this time is the difficulty in taping and splicing fiber optic cable. For that reason, initial uses of fiber optics have been in the main trunks of telephone networks and a few cable systems. Usage is likely to increase as the technology is refined and the cost of fiber approaches that of wire cable. It seems unlikely that fiber optic cable will reach as far as the individual subscriber drop for many years.

2

Cable System Revenues And Expenses

By

Deborah Love-Heilig

Chapter 2: Cable System Revenues and Expenses

Financial and economic analysis plays an important role in the course of action taken by the industry decisionmakers, policymakers, and local officials. This chapter explains sources of revenues and expenses of cable systems to show how certain economic and financial decisionmaking works. Rate regulation and associated issues are discussed in volume II.

The Sources of Revenue

Basic service can be defined simply as a grouping of local broadcast channels, local origination and access channels, and satellite signals provided to subscribers for a flat monthly fee. Additional monthly fees are charged for other television sets connected to the cable service, commonly called "second set" revenues. The operator also charges the subscriber a one-time installation fee for hooking up cable service. If subscribers drop cable service for a while and then decide to subscribe again, they are charged a "reconnect" fee. These installation fees are similar to those charged by the telephone company.

Tiering

"Tiering" of basic service is a relatively new phenomenon in the cable industry. A multiple-tiering structure allows charges and services to vary, so that subscribers pay only for the level of service they want. Tiering also allows the cable operator to maximize basic service revenues from those willing to pay for higher tiers of service. Most often, many of the more attractive pay services are available only on the higher tiers of service.

The advancement of satellite technology that resulted in the availability of pay-per-channel programming has had a remarkable impact on the cable industry. The marketability of pay-per-channel services such as Home Box Office (HBO), Showtime, Cinemax, Spotlight, Home Theater Network, Front Row, and others has exceeded the early expectations of industry analysts. Cable operators now can expect to receive a substantial portion of their revenues from pay services. Premier movie pay services have changed the focus of the cable industry from a retransmission service to an entertainment service, and demand for these services has made it profitable for cable companies to build systems in areas that receive adequate over-the-air television reception.

Advertising

Local cable operators derive advertising revenues primarily from the sale of time on local origination channels and "spot" time on satellite services to local businesses. Advertising revenue is usually measured as a dollar amount per subscriber per year spent by local businesses. In the past, advertising has not been a source of substantial revenues to cable operators. Industry analysts, however, are optimistic about the potential growth of

advertising revenues on cable. In 1981, the industry average was around $2 per subscriber annually. Analysts anticipate that this figure might increase to or exceed $10 per subscriber per year by 1990.

The bulk of advertising revenue generated in the cable industry does not accrue to local operators, however. Most cable advertising time is sold by the owners of national satellite services such as USA network, Cable News Network (CNN), or the Entertainment and Sports Programming Network (ESPN). Most pay services have resisted the potential revenues they might receive from advertisers, fearing that consumers will be less willing to pay for ad-supported programming. However, some analysts expect that it may be difficult for these services to continue to relinquish ad revenues, especially if pay subscribers prove willing to continue the service with ads.

Security Service

Home security service over cable is still in its infancy. For security services, subscribers pay a monthly fee to cover the cost of continual monitoring, usually in the range of $12 to $20 per month, and an installation fee to cover the cost of wiring the home. It is estimated that current average charge for wiring an entire house for cable-monitored security service is between $450 and $650.

In some cases, the cable operator will allow a private contractor to lease a cable channel to provide security services to cabled homes. In these cases, the cable operator receives only leased channel revenues. In other instances, the cable operator contracts with an outside security service company to do only the home security installation. In this case, the cable operator receives the monthly monitoring revenue. Many cable systems will never offer security services because the potential subscribership is too small to justify the expenditure in the sophisticated computer technology and additional staffing.

Interactive Services

Revenues from interactive services such as pay-per-view, shop at home/bank at home, and database transmission are difficult to predict. Although the technology is currently available, existing applications are few. For cable companies to provide these services, large capital investments must be made for interactive subscriber terminals and headend computers. Over the next five to ten years, we can expect that these services will be a substantial source of revenue only to systems in large urban markets. The policy of most cable operators is to wait until a threshold number of subscribers within a given system exists before introducing interactive technology.

Where interactive services are offered, subscribers pay an additional monthly fee to have the option to use those services. This fee is essentially a converter rental fee to cover the cost of the inexpensive interactive converters, which in 1982 cost at least $300 per unit. This fee usually runs

between $3 and $5 per month.

Most interactive service revenues besides converters come from pay-per-view fees. For example, a special channel might be made available by the operator for pay-per-view subscribers. The subscriber would be billed at the end of the month for seeing a particular program. Similarly, interactive computer time used by a subscriber is billed per use. With pay-per-view programming, the operator cannot know for sure how much a subscriber would use the interactive features. Therefore, it is difficult to forecast revenues from this service.

Institutional or commercial use of cable television is another area for which little substantive data exist for accurately forecasting revenues. Some industry analysts believe that cable will be able to compete effectively with other providers of telecommunications technology for data transmission and videoconferencing. Others are more skeptical. The future of these sources of cable revenues depends largely upon the extent to which cable companies can offer competitive pricing and technology.

Cable System Expenditures

Operating Expenses

Operating expenses are the day-to-day expenses for wages, benefits, and other items that a business incurs. In the cable industry, annual operating expenses are often broken down into three categories: plant expenses, origination expenses, and general selling and administrative expenses.

The largest plant expense is salaries, followed by plant maintenance, converter maintenance, pole and site rentals, power, vehicles, and rent. Origination expenses include all costs associated with providing programming over the system. General selling and administrative expenses include all costs associated with maintaining the business entity. Two of the largest items under general selling and administrative expenses are franchise fees and services purchased from the parent company, otherwise known as corporate overhead. In most cable systems with recently written ordinances, the franchise fee is a percentage of gross revenues.

Subtracting plant, origination, and general selling and administrative expenses from total revenues results in a system's operating income. The ratio of operating expenses to total revenues (called the operating ratio) is often used as a measure of the efficiency and profitability of a local cable enterprise. Typically, an efficient cable system has a 55 to 65 percent operating ratio. An operating ratio of less than 55 percent may indicate that subscriber rates are higher than they need to be. If the operating ratio is higher than 65 percent either the system may be operating inefficiently or the rates are too low. How a cable operator allocates expenses also influences the operating ratio. Large expenditures in services with a low revenue turnaround may cause a higher operating ratio.

In addition, cable systems incur interest and depreciation expenses and must pay Federal taxes. Interest expense is the cost of borrowing capital funds used to construct and operate of the cable plant. Depreciation expense is the cost of using equipment or buildings that were acquired and are being used in operating the business. Such items often have a high initial cost and are kept over an extended period of time, known as their useful life. As such, a portion of their initial cost becomes their depreciation expense.

Subtracting interest and depreciation expenses from operating income yields pretax income—the portion of earnings subject to Federal taxes. However, tax laws allow companies to carry forward losses from previous years to diminish their tax liability on pretax income. Also, companies can subtract a percentage of capital expenditures made that year from their pretax income before figuring the taxes they owe. Once the value of the taxable income is determined, a corporate tax rate (currently 46 percent) is applied if the operation is a corporation. If the business entity is a partnership or a sole proprietorship, then the pretax income is added to the taxable income of the partner or sole proprietor.

Capital Expenditures

Taken together, capital expenditures and operating expenses determine the revenue requirement of the cable operator: The amount it needs to cover its operating costs and earn an adequate return on its investment. The primary capital expenditures associated with the construction and operation of a cable system are as follows:

Antenna and towers
Buildings
Converters
Distribution plant
Drops
Earth stations
Engineering
Headend
Institutional network
Land
Microwave
Origination equipment, studios, and vans
Pay-cable-related equipment
Test equipment
Vehicles

Of the above, converters, distribution plant, and drops constitute the bulk of cable system capital expenditures.

Converters represent an increasingly large capital cost as more cable systems use addressable and interactive connectors. Addressable converters, however, can reduce some costs of a cable system because they eliminate the need to send personnel to a subscriber's house when a programming service change is required.

Distribution costs are costs of building the cable plant and are typically figured per mile. Distribution costs include make-ready, engineering, labor, hardware, cable, and electronics. Aerial plant construction is considerably cheaper than underground plant, typically by at least 50 to 60

percent. The higher cost of building underground plant is mostly due to additional labor costs and the extent to which conduit or armored cable is used.

The channel capacity of the plant influences its building costs. 400 MHz systems are more expensive than 300 MHz cable systems to construct because they require additional electronics. The current average cost per mile of constructing a dual 300 MHz cable plant is about $15,000 per aerial mile and $22,000 per underground mile. A dual 400 MHz cable plant costs about $18,000 per aerial mile and $28,000 per underground mile.

Total capital expenditure less accumulated depreciation is the net investment of the cable operator in the system. It is on this net investment that the operator expects to make an adequate return. To justify spending the large sums of capital on a cable plant, the owner must be certain that revenues will exceed operating costs. Normally, a cable system will not realize any profits for the first five to seven years of operation, because its capital investment is so high during the initial years of system construction.

Deciding to Bid for a Franchise

Before a cable company decides to bid for a cable franchise, it estimates the worth of that franchise. To do this it must determine the capital costs associated with constructing a proposed cable system that would be competitive with other potential bidders. It must then examine the potential market for cable service in the community to see whether adequate revenue potential exists to cover operating costs and yield profits consistent with its desired return on investment. If the revenue potential does not exist, the company may decide not to bid rather than propose a less costly system that would be profitable but most likely lose in a competitive bidding process.

The competitive franchising process is an expensive one for cable operators. In addition to application fees, substantial staffing and resources are needed to create a successful franchise proposal.

Several factors influence a company's decision to bid for a franchise in a particular market. A high-density area has the potential to bring a high-revenue return per mile of capital expenditures. Low construction costs due to geographic location or high potential proportion of aerial plant will also encourage bidders. High market-penetration potential due to unavailability or poor quality of over-the-air TV reception will be attractive to cable companies. High personal income per subscriber is another feature a company looks for. And, if a cable operator has an existing system in a nearby community, it may wish to seek the franchise to consolidate costs and thereby lower the average cost of service per subscriber.

Determining the Value of a Cable System

Fair market value is the preferred valuation of the cable operator. The fair market value is the price that a cable operator could receive if it

placed the system on the open market. Cable systems usually are sold for some multiple of cash flow per subscriber, less any outstanding liabilities. Cash flow is essentially revenues less operating expenses. A multiple of 8 or 10 times cash flow is not uncommon in the cable industry. For example, a system with 20,000 subscribers who spend an average of $20 per month on cable service and cost the operator $170 per year to serve would have a cash flow per subscriber of $70. Ten times this value is $700. This system might sell for $14 million less any outstanding debts. Implicit in any such valuation, however, is some assumption about the continuation of the cable franchise. If a cable operator is approaching the end of its franchise term and it appears unlikely that the franchise will be renewed, it could be difficult to find an eager buyer unless an agreement could be reached with the city to extend or renew the franchise for the new operator.

An issue that has been a source of controversy between cities and cable operators is the price that the city should be able to purchase its cable system from the cable operator. Cable companies claim that the city should pay fair market value because that is the price they could receive from other interested buyers. But city officials have often claimed that the selling price to the city should be book value—the value of the undepreciated portion of capital assets. Because a cable company would have depreciated the bulk of capital assets over the period of the franchise, book value is a comparatively small amount. The argument for book value buy-back is that the cable operator has had the term of the franchise to achieve an adequate return on its investment. In other words, it made the return it was guaranteed because the renewal of the franchise was never a certainty.

An alternative valuation for a buy-back provision is replacement cost less accumulated depreciation. Replacement cost is defined as the cost of building a similar system today less any depreciation taken on the existing plant. Many cities have chosen this valuation as a compromise between fair market value and book value.

Summary

The value of a cable franchise depends upon an operator's projections of the return it can achieve on its investment. To estimate this potential, the company must forecast the costs of bidding, constructing, and operating a system. It must then examine the market to determine the demand for cable service and compare the potential return to the capital needed to build the system.

The value of a constructed cable system can be measured at its potential selling price. But the selling price depends on who is buying. If the buyer is another cable operator, then fair market value is appropriate. If the buyer is the city, then book value or replacement cost might be more appropriate. The critical determinant is the assumption being made about the perpetuity of the franchise term.

3

Enhanced And Interactive Services

By
Janet Quigley

Chapter 3: Enhanced and Interactive Services

A modern cable system can provide many kinds of electronic services to the home in addition to standard television. Not long ago these services were collectively referred to as cable's "blue sky." Now they are being routinely offered in cable franchises in urban centers and metropolitan areas. Such services include the following:

- Home security and fire alarms;
- Shopping and banking at home;
- Polling;
- Pay-per-view programming;
- Video and instructional games;
- Meter reading and energy management; and
- Home information services; including teletext, videotex, and access to data banks and computerized sources of information.

As of this writing, a few systems have had experience with security and fire alarm service on cable; this topic is discussed in chapter 4. Market experience has been limited with the other items discussed in this chapter. Thus, an adequate profile of their relative commercial prospects has not yet emerged.

In some instances, such services require or work most efficiently with home computers as terminals rather than with the numeric keypad usually associated with two-way addressable cable converters. Such computers, of course, are proliferating rapidly in American homes.

Cable, however, is not required as the communications link for homecomputer access to various databases, services, and information. In most instances, access is made through the telephone system. Cable's ultimate role as a link to these sources of information has not been fully established.

To help make cable more attractive as a delivery medium, "packages" of various types of enhanced and interactive services are being created, including some services available only through the cable system and services that a computer owner might access separately.

A short discussion of the status of each major type of service is provided in the following text. This is followed by descriptions of QUBE and INDAX, two commercial "packages" for cable subscribers in which several interactive services and capabilities are combined and tailored for cable subscriber use.

Home Shopping

Pilot programs for home shopping services by cable were introduced in 1981 by Cox, Times Mirror, Adams-Russell, Modern Satellite Network, and the Great American Teleshopping Network. CompuServe, available on Warner-Amex's Columbus system, includes classified ads from newspapers it carries. These services use both one- and two-way technology.

A two-way service, Comp-U-Star, provides discount shop-at-home services to owners of home computers. Comp-U-Star is a data retrieval system. It lists products using alphanumeric displays. As of January 1982, the firm offered more than 30,000 products, the descriptions of which are entered into the database in a way that permits comparison shopping. It lists all items of a given type by price, brand name, and other categories. "Shopping" can be done at any hour, and goods are delivered to the subscriber's home. Purchases are charged to the major credit card designated by the user. The subscriber receives a personal membership number and password, which must be entered to make transactions. Membership costs $25 per year; the member also pays connect time charges of 50 cents per minute from 9 a.m. to 5 p.m. on weekdays and 25 cents per minute at other times. Times Mirror has been testing Comp-U-Star on cable, and the firm is seeking other cable affiliations.

Times Mirror is testing a one-way shopping service with Sears, Roebuck and Co. The Sears service is a television program that displays and describes merchandise; viewers make purchases by pressing buttons on an addressable converter or other type of interactive terminal. There is some speculation that visual images might encourage impulse buying more than alphanumeric displays would, but consumer acceptance of either the Sears or the Comp-U-Star approach has not been established.

The Modern Satellite Network has carried the "Home Shopping Show" since 1980. The talk-show format allows retailers to discuss and demonstrate a product or line of products in a "soft-sell" approach termed an "infomercial." Products are not directly marketed during the show, but some retailers experiment with cable audience interest by offering discount coupons or "giveaways" via a toll-free number. Retailers pay $11,000 for an 8½-minute interview or $29,000 for a full half-hour.

Cox is currently testing a shopping feature as part of INDAX, its information retrieval service. The subscriber chooses a product from the INDAX data bank and orders it via an addressable converter. The order is registered in the INDAX computer and transferred to an "electronic middleman," Viewmart, which handles all contacts with retailers. Viewmart processes the order and bills purchases to the credit card number provided by the subscriber.

Home Banking

Home banking is more complex than home shopping. It requires arrangements with banks, provisions for security, and the appropriate hardware and software to perform several functions. Subscribers should be able to obtain bank balances, make transfers, and pay bills. Bank Ohio in Columbus, Ohio, has tested such a service through a combination of cable and telephone lines.

Times Mirror is planning a 6-month home-banking experiment with Bank of America in San Diego. Users will be able to pay utility bills by cable

as well as determine balances and make transfers.

In Cox's Mission system, also in San Diego, banking is being coordinated by HomServ, another "interactive middleman." HomServ handles all negotiations with banks and retail merchants to authorize credit card and bank account transactions. The main components of the Cox/HomServ system are account inquiry, bill payments, and direct ordering of retail merchandise. Airline reservations and home security can be incorporated into the system.

Polling

Two-way addressable converters with numeric keypads permit viewers to transmit a limited selection of responses back to the headend in response to queries or requests for information made on the screen. The responses of viewers are instantly compiled by a computer at the headend, and the tabulations are shown immediately on the screen.

In the QUBE system in Columbus, Ohio, the system's polling capability has often been used for entertainment purposes. By indicating their preference among five different response options presented to them on the screen, subscribers have voted on magazine covers, the merits of amateur performers, the round-by-round progress of prize-fights, desired endings for soap operas, and choice of plays in football games. Other applications are informational, such as consumer information programs in which viewers signal their reactions to various products and services.

More important questions are raised by the use of cable's polling capabilities in political matters. QUBE viewers have been asked to provide their opinions on political issues and events, to react to political speeches and debates as soon as they appear on the screen, and to express opinions on the outcome of forthcoming elections. Some analysts believe that widespread use of such instantaneous and unrepresentative but highly visible material may have an adverse effect on the political decisionmaking process by obscuring, distorting, underrepresenting, or oversimplifying the true opinions of the public.

Pay-per-View

In a computer-controlled, addressable cable system, the computer knows the electronic "address" of each subscriber. This capability is used to respond to subscriber requests for various premium programming. The computer can immediately activate the premium channel or channels that the subscriber requests. It can also be used to disconnect service when a subscriber has stopped a service or has not paid bills promptly.

This capability also makes it possible to assemble audiences, subscriber by subscriber, for individual programs that such subscribers are willing to pay for. Such offerings can include professional sports events, first-run movies, popular music concerts, and other types of entertainment; cultural material; college credit courses; and computer-assisted instruction.

As the cable industry grows, so does its bidding power in the programming marketplace. The medium's attractiveness to professional sports and entertainment promoters may increasingly take the form of selling such material on a pay-per-view basis. This development could have an adverse impact on the current structure of over-the-air broadcasting, and important commercial and political battles could ensue. The development of pay-per-view for individual entertainment and sports events on cable could be hastened by the growth of subscription television (over-the-air pay TV), which could be a joint bidder with cable for various top-rated events.

For local groups, pay-per-view offers the possibility of transmitting special programs and events from local civic and community centers, thereby providing a greater basis of financial support for such events. In education, pay-per-view opens up possibilities for transmission of course material directly to the home.

Interactive capability is not required for pay-per-view service—subscribers can "order programming" by placing a phone call or mailing a postcard to the cable company. In the current developmental state of pay-per-view programming, subscribers on systems where it is offered must often phone or mail in their requests days or weeks prior to the showing of the program. In the future, it is anticipated that addressable converters that enable subscribers to "order" individual programs by pushing buttons on their converters, right up to the moment when the programming is shown, will greatly facilitate impulse buying of programs. This development, in turn, may be a major factor in fostering the spread of interactive converter technology throughout the industry.

Meter Reading and Energy Management

Reading water and gas meters in subscriber homes is another function that can be performed using the subscriber cable network. Development of services in this area has been slow, however. Among other things, progress has been retarded by the fact that not all homes subscribe to cable. But equipment to perform such functions is being developed and demonstrations are underway.

Datavision Company of Roseville, Michigan, has developed an interface device (modem) that can retrofit water meters for as little as $18 and gas meters for $35. The company plans to use its equipment in Cox Cable's St. Clair Shores, Michigan, system and in Teleprompter's Grosse Pointe and Dearborn, Michigan, systems. Other companies actively involved in meterreading experiments include Adams-Russell (Boston suburbs), Continental Cable (Springfield and Brockton, Massachusetts), and Comcast (Clinton Township, Michigan).

Comcast began a 6-month experiment in October 1981 involving the installation of 50 units of a modem developed by E-Com in its Clinton, Michigan system that will allow the city water department to generate monthly bills. The modem used in this demonstration sells for $200; the

company expects to produce a second-generation device in 1982 that will sell for $75. Comcast has stated to the Clinton Water Utility that they expect a "worst case" cost of $3 per meter. In another test, 100 homes in Omnicom Cablevision's system in Northville, Michigan are participating in a demonstration using Systems & Support, Inc.'s Datalert terminals to read consumer water meters and to communicate with a central computer via the interactive system. The project uses meters and automatic reading registers manufactured by Neptune Water Meter Company.

Energy management systems have been offered in institutional network bids in recent major franchise competitions. Studies conducted by energy consultants have indicated that municipalities and major commercial users can achieve substantial savings through use of such systems. Many analysts believe, however, that such systems are not likely to be economically viable for installation in private homes in the near future.

Home Information Services

One of the long-awaited promises of cable is delivery of information to the home. In the next five years, industry seers predict that the contents of newspapers, local libraries, national databases, college courses, and possibly even mail will enter American homes via a wire. This will be made possible by addressable converters with numeric keypads resembling pocket calculators and by the spread of home computers connected to the cable. Information stored in regional or national computers will be made accessible in the home through a combination of cable, telephone, and possibly satellite connections. These home information services are expected to be convenient, energy-efficient and competitively priced with alternatives. These types of services are still being developed, however, and will not be generally available on cable until the mid to late-1980's.

Various home information services are currently available or on trial in England, France, and Canada. Teletext, or one-way service, is usually encoded and transmitted "under" regular programming on standard broadcast channels. Such systems have been developed under the names of Ceefax and ORACLE in Britain, Antiope in France, and TV Ontario and Telidon in Canada. Other systems often called videotex provide the user with a direct link to a computer via telephone or cable lines. Prestel in Britain, Teletel in France, and VISTA in Canada are examples of this type of system. Exhibit 3-1 lists home information services available or on trial on cable systems.

Teletext and Videotex

Teletext is a one-way form of communication. Several hundred individual frames of information are continuously transmitted, round-robin fashion, so that the entire sequence is repeated every few seconds. The frames of information are accommodated on a portion of the standard television signal called the vertical blanking interval, which is normally in-

visible. Every TV channel can carry a teletext round-robin in addition to a regular TV picture. The home viewer, using an interface device with a numeric keypad, searches through menus of subjects, narrowing down the search by accessing increasingly specific categories. These services also can be received by home computers linked to the cable.

Videotex is an interactive technology; there is no transmission until the subscriber requests it. Instead of intercepting frames of information being transmitted over TV channels in continuous cycles, the videotex user summons to the home screen frames of information that are stored in a computer. To do this, the user transmits the appropriate questions or numbers to the computer, stating what is wanted, and the computer responds by sending the information downstream to that terminal only. As with teletext, videotex can be implemented by home computers, which offer greater flexibility and ease of access to computerized data. A discussion of the main differences between teletext and videotex follows.

Capacity

The two systems vary greatly in capacity. Videotex has a capacity for far more information than teletext because it gives the user direct access to the central computer. Teletext offers a limited number of pages, which are cycled downstream in sequence; the viewer selects a page only from those sent. The response time required for the requested page to be delivered imposes a practical limit on teletext capacity of approximately 400 pages, whereas videotex has a theoretically unlimited capacity to deliver information. The Prestel system currently offers 200,000 pages.

Format

Teletext can be sent on either a full channel or in the vertical blanking interval. Videotex requires a full channel. Different methods of "composing" each page require varying amounts of data. In the future, cable operators may have to weigh more efficient use of channel space against a greater capability for data, when choosing which type of service to offer.

Hardware

The two technologies require different equipment to transmit and receive information. Teletext requires a decoder that makes simple choices of pages as they cycle by. A videotex terminal must be able to send more detailed requests for information (i.e., programs) to the central computer. Development of the more costly complicated equipment needed for videotex is lagging behind that for teletext. Home computers are available, but they must be made compatible with cable, which means that modems must be developed. Standardization of hardware and technology will be crucial to the success of text services. Even the most optimistic analysts expect such developments to be several years away.

Exhibit 3-1
Information Services on Cable

Sponsor(s)	Location	Service	Service Providers	Price	No. of # Users	Start/ Duration
Times Mirror/ Videotext Services Infomart	Mission Viejo, CA Palos Verdes, CA	Data retrieval & transactions 20,000 pages	10 T-M companies 30 independent companies; Telidon (Infomart) L.A. Times AP, UPI Newswires Better Homes & Gardens Official Airline Guide World Book/ Childcraft Int'l.	Free initially, then "nominal" charge	150 200	March 1982 (6 months)
Times-Mirror/ Antiope/ Louisville Times	Louisville, KY	Teletext, classified ads	Dissly (Antiope) Louisville Times Louisville Courier-Journal	NA	10-20	Jan. 1982
Vision Cable/ Dow Jones	Clearwater, FL Ft. Lee, NJ	Financial information retrieval	See Las Colinas, TX	$121/month (est.)	20,000 potential	Feb. 1982 Late 1982
Warner-Amex	Columbus, OH Pittsburgh, PA Cincinnati, OH Dallas, TX	Data retrieval news & information classified ads	CompuServe New York Times L.A. Times Washington Post Columbus Dispatch Other newspapers	$13.95 QUBE (28 channels)	23,000	1977 - Pending construction Same
SSS Cabletext	National	Commodity exchange information	Quotrader Corp.	$1,530 (decoder)	10	Dec. 1981

Exhibit 3-1 (continued)
Data Information Services on Cable

Sponsor(s)	Location	Service	Service Providers	Price	No. of # Users	Start/ Duration
ATC/Time, Inc.	San Diego, CA Orlando, FL Littleton, CO	Teletext via Time, Time, Inc. transponder; 5,000 pages	Time, Inc. Local Newspapers	Will vary	47,000 poss. 66,000 poss. Not available	Spring 1982 1983 1983
Cable Atlanta	Atlanta, GA retrieval via data-base	Information			7,000 poss.	Spring 1980
Cox Cable	San Diego, CA Omaha, NE New Orleans, LA Vancouver, WA Tucson, AZ Santa, Barbara, CA Macon, GA	INDAX information retrieval & transactions	The Source Local newspaper	Free for test; then basic service rate	60-300 28,000 poss.	Fall 1981 Pending construction 1982. Same Same Same 1982
Las Colinas Associates/ Dow Jones	Las Colinas, TX	Financial information retrieval	Dow Jones Wall St. Journal Merrill Lynch Barron's Other business/ financial news	NA	NA	1979 (test)
Sammons Cable/ Dow Jones	Park Cities, TX	Financial information retrieval	Same as above plus Dallas Morning News	$12/month; Optional terminal rental approx.	Over 100	Oct. 1980 Permanent; Pending construction

Costs

The costs of providing such services are bound to vary. Information sources must be bought or developed, hardware and computers for the headend must be developed, and home terminals or converters must be affordable. In both teletext and videotex, a tradeoff exists between capabilities and costs for headend equipment and for home equipment. A more complex system is likely to require most costly home terminals, headend computers, and information. It will be at least several years before any significant amount of data on consumer demand for these services are available.

Uses of Teletext and Viewdata

Newspapers

A survey performed by the British Broadcasting Corporation (BBC) teletext system, Ceefax, found that its most popular services were news headlines, television program guides, and word games. The electronic newspaper is likely to become a major service in the United States as well. According to the American Newspaper Publishers Association, at least 70 newspapers were providing local cable systems with material as of February 1982, and such service is swiftly accelerating. Channels dedicated to newspaper-provided material are often leased by the newspaper. Content is provided by character generators that provide "news crawls" on full channels. Experiments with "electronic publishing" are underway in several areas across the country.

In Park Cities, Texas, Sammons Cable has recently begun marketing an electronic news service it began to develop in 1980. Warner-Amex's system in Columbus, Ohio, is the site of a news project involving 11 newspapers, and a new venture involves satellite-delivered news from a service called Home Link Communications.

National Databases

News and information are being provided by emerging national public databases such as The Source, CompuServe, the New York Times, Dow Jones, and Reuters News Service. The Source is the heart of Cox's proposed INDAX text service, whereas CompuServe will provide the basis for Warner-Amex's next information retrieval tests. The range of information available in these public databases is already large and is continuing to grow. News summaries and analyses; financial information; national, State, and local political information; shopping services such as Comp-U-Star; stock analysis; business publications abstracts; electronic mail; private teleconferencing; access to encyclopedias; consumer information; movie, book, and record reviews; word games; and medical and health information are all available on public databases. See exhibit 3-2 for a list of data retrieval/teletext services on cable.

Local Databases

Some cable operators plan to develop locally and community-oriented databases, with an opportunity for community input through either access or local origination channels. Some companies have offered to place keyboards for community use in libraries, schools, government buildings, and other public places for public input and updating.

Assuming that hardware is developed, programming and software will be crucial components of information services. Many databases exist apart from cable, but these, like the hardware, must be adapted for cable in order to be useful. They must be technically compatible and "user friendly."

Captioning

One text service of particular social benefit is captioning. The same technology that encodes data on the vertical blanking interval for teletext can provide captioning for the hearing impaired, who number 14 million to 16 million of the U.S. population. The National Captioning Institute (NCI) currently offers this service, marketing decoders through Sears for reception of "closed" captioning. Many local groups provide "open" captioning, which does not require a special decoder to be received.

NCI is believed to be working toward a licensing agreement with cable operators for its captioned programming, so that subscribers who wish to receive captioning will no longer have to purchase a $275 decoder unit. NCI provides approximately 40 hours of closed-captioned programs per week in conjunction with ABC, NBC, and PBS. The NCI hearing-impaired audience is estimated at 150,000.

CBS, NBC, and AT&T are testing alternative forms of text delivery, which will probably be adaptable for captioning. One barrier to swifter development of this service is the lack of standardization in the text field. Decoders will develop quickly at reasonable prices as soon as a standard prevails.

QUBE

The most established of enhanced services today is Warner-Amex's QUBE service in Columbus, Ohio. This service began as an opinion polling and pay-per-view service in 1977 and has since expanded to include home security, home banking, and computerized access to newspapers and other information services. A home energy management system is currently under development.

The Columbus system has approximately 50,000 subscribers, of these, 34,000 take the QUBE option. QUBE is the top tier of the Columbus cable system; two other tiers are available at lower monthly rates. The basic monthly rate for the QUBE tier is $11.95, with additional charges for usage-sensitive pay and information services.

Exhibit 3-2
Other Enhanced Services

Sponsor(s)	Location	Service	Service Providers	Price	No. of # Users	Start/ Duration
Adams-Russell/ J. Walter Thompson	Peabody, MA	CableShop - 3-7 minute commercials; requested by phone (4 channels)	12 advertisers	Free with basic	8,000 potential	March 1982
Capital Cablevision Cox Cable Rogers Cablesystems Teleprompter United Cable	Jackson, MI Moline, IL Brampton, Ontario Santa Clara, CA Boise, ID	PlayCable	General Instrument Jerrold/Mattell	$10-20/month; $250 decoder	126,000 potential	1981 - Test 1982 - Available
Cablevision Systems	Yonkers/ Oyster Bay, NY Bergenfield, NJ	Video Shopper: 18-minute "info-mercials," order via "800" number	American National Cable Communications, Inc. (ANCCI)	Free	146,000 potential 25,000 potential	Sept. 1981 Feb. 1982
Cox Cable	San Diego, CA	INDAX banking, shopping, data retrieval	Banking: HomServe, 6 local banks. Shopping: Viewmart, 13 retailers	Free for 3 months	300	Feb. 1982

Exhibit 3-2 (continued)
Other Enhanced Services

Sponsor(s)	Location	Service	Service Providers	Price	No. of # Users	Start/ Duration
Modern Satellite Network	National	Catalog shopping channel via satellite	Home Shopping Show	Free with basic service	2,800,000 potential	1980
Teleprompter	Middletown, CT	Pay-per-view 5 movies/month and sports	MCA Universal, other sources	$3.00 for average per movie	2,000	Jan. 1982
Times-Mirror	Orange City, CA Hartford, CT Springfield, IL Louisville, KY Newark, OH Midland, TX	Shopping channel via satellite	Comp-U-Card of America	Annual membership fee: $18.00	150,000	April 1981
Times-Mirror	Mission Viejo, CA Palos Verdes, CA	Home banking Home shopping Electronic mail Ticket sales	Bank of America Sears Hallmark Cards Ticketron	4 months free; possible nominal charge after	150 200	1982 1982
Warner-Amex	Columbus, OH	a) Banking b) Opinion Polling c) Pay-per-view (7 movies per month and sports, live concerts)	a) Bank Ohio b) QUBE staff c) Various	a) Free for test b) Part of QUBE rate: $13.95/ month c) $ 3.50 avg. $12.00 avg. $10.00 avg.	100 34,000 potential	1980 1982 1977

The QUBE service consists of ten regular broadcast channels, ten "community" channels on which opinion polling takes place, and ten pay-per-view premium channels that offer old and new films, cultural events, and college courses. The price for each pay-per-view program ranges between 50 cents and $3, and viewers are allowed a two-minute grace period of viewing before the "meter" starts running. A parental lockout device is available for these premium channels.

The QUBE converter consists of buttons for each of the 30 channels plus five response buttons. These buttons are used to answer yes/no and multiple choice questions on local talk, variety, and public affairs shows. For instance, "Columbus Alive," a local talk show, measures viewer opinions on well-known guests. A consumer information program enables subscribers to register satisfaction or dissatisfaction with various products. Opinions also can be measured on political issues, as when 7,000 viewers responded to questions after a speech by President Carter. The following services also are available with extra equipment:

- A home security service consisting of burglar and fire alarm sensors and a medical alert button. Installation costs between $99 and $400, with a monthly charge of approximately $10.
- A computer service offering 10 local and national newspapers, stock and financial information, video games, and electronic mail delivery. This service requires a home computer. CompuServe connect time is about 9 cents per minute.

INDAX

A more recent development in enhanced service systems is Cox Cable's INDAX system, which will enable subscribers to shop, bank, and receive news and information via cable. The service is being tested in San Diego and will be built in Omaha, New Orleans, Tucson, and Vancouver, Washington. In Omaha INDAX users will pay $10.50 for basic service plus $5.95 for INDAX.

Rather than developing the entire array of interactive services itself, Cox contracts with specialized service providers. Source Telecomputing Corp. of McLean, Virginia, provides a 700-"page" teletext service offering news, travel schedules, and other information. (Future systems will carry The Source's expanded two-way service, which includes electronic message delivery.) Unlike two-way text services, the teletext service is billed on a flat fee rather than a per-use basis.

Two other components of the system, shopping and banking, are provided by Viewmart and HomServ, respectively. These organizations make all arrangements between the subscribers and the bankers and merchants. For instance, Viewmart provides a text "menu" of merchandise organized in six categories: "Special of the Week," "Brand Names," "Stores," "Products," "Services," and "Gift Ideas." The viewer then selects the desired item from the menu and enters a credit card or authoriz-

ing number on the INDAX keypad. HomServ functions as a similar liaison with area banks.

The interactive converters used by Cox also make possible instant access to pay-per-view movies, eliminating the need to write or phone in orders ahead of time. Subscribers can also program their converters to block out movies automatically based on their MPAA ratings.

The two-way capabilities of the INDAX system expand subscribers' options from simple responses to detailed requests. Whereas QUBE subscribers could only answer "yes" or "no" to a specific item being advertised, the INDAX system gives subscribers greater selection and versatility. See exhibit 3-2 for a summary of enhanced services on cable.

Privacy and Other Issues

The proliferation of two-way interactive cable systems and services such as shopping and banking at home have raised many concerns regarding subscriber privacy. Additional problems are raised by the polling capabilities of interactive systems. From a technological point of view, nothing prevents the computers at the system's headend from compiling the results of such polls on an individual basis and thereby generating profiles of the points of view and attitudes of each subscriber.

The security of financial transactions, the protection of subscribers against commercial exploitation through monitoring of their viewing habits, and the possible interest of law enforcement authorities in the behavior of various citizens raise important questions that have not yet been fully addressed in a national dialog. Thus, many recently franchised cities have required cable operators to protect subscriber privacy by prohibiting the operator from unauthorized use of subscriber data. Volume II, chapter 13, discusses privacy issues further.

In addition to privacy, several legal, technical, and economic questions will have to be answered as enhanced and interactive services become widespread. Much of the hardware associated with the delivery of interactive services is still being developed. In some instances, the hardware problem is generic to the technology; the lack of industrywide standards for teletext and videotex is an example of this problem.

Software development for many services is also in preliminary stages. Consumer acceptance will evolve only when adequate software to fulfill consumer needs has been developed.

Many economic questions must be asked about the viability of enhanced and interactive services in the marketplace. The hardware and software for many of these services is costly, and consumer demand is as yet undetermined. Many services may not find wide acceptance. The more complex the service is, the greater the price tag will be, causing all subscribers to pay for capability that may be commercially attractive to only a few.

It is difficult to predict where cable will fit in the information delivery business. Many potentially competitive technologies have not

developed far enough to provide analysts with a clear idea of how information will travel in the future and what it will cost.

4

Security And Fire Alarm Services

By
John Mansell

Chapter 4: Security and Fire Alarm Services

In recent years, cable companies have begun to offer burglar and fire alarm services to subscriber homes via cable, a response to the increasing demand for security and fire alarm systems in general. Experience to date indicates that security service may be a profitable field for cable companies; if so, it will provide a source of revenue for costly two-way systems in major markets and possibly an impetus for the further development and use of two-way cable hardware.

At present, only a small percentage of U.S. homes have centrally monitored security alarm systems. Many factors, including rising crime rates, psychological factors, geography, and economics are stimulating a more widespread demand for security services.

Central station monitoring can also improve firefighting services. Thousands perish each year because firefighters are not called quickly enough to contain a blaze. According to the U.S. Fire Administration, indirect monetary losses from fires are more than $20 million a year.

System Considerations

The strength of a cable system for monitoring fire and burglar alarm systems is its ability to disseminate information from a single source to a large number of remote points. The technology of the subscriber network, however, raises problems that must be solved for successful security operations.

In a cable system, downstream video signals are usually transmitted at frequencies ranging from 50 to 440 MHz. Alarm signals and other data transmissions, which use a much more limited amount of bandwidth, typically travel upstream at frequencies from the 5 to 30 MHz. These return signals often face a more hostile electronic environment because of shortwave, CB, and AM radio transmissions on frequencies in the same range. If any of these outside signals penetrate the layers of protective shielding and insulation of the cable, the "noise ingress" can contaminate the quality of the return signal. This interference does not significantly disturb the quality of video pictures, but it can threaten the integrity of alarm signals and other data transmissions. Some two-way cable systems, such as Warner-Amex in Columbus, Ohio, and Rogers Cablesystems in Syracuse, N.Y., use a technology called bridger switching to prevent the cumulative buildup of noise. In effect, the cable system is sectionized; part of the city is polled while another part is switched off.

Security service has also placed pressure on cable operators to increase reliability and maintenance of their systems in other respects. Power outages caused by lightning, ice storms, and other natural causes might be tolerable for entertainment services, but are unacceptable in alarm monitoring. Consequently, many cable operators believe standby power and a backup redundant mode of transmission are critical. Warner-Amex, for ex-

ample, has a digital communicator built into all its control panels. If the cable signal cannot get through, the digital signal is automatically sent over a regular telephone line to the cable central station.

Use of digital communicators also enables cable companies to market security services outside their franchise territories. Indeed, several cable companies have 50 percent or more of their security customers linked by digital dialers in areas not yet wired for cable or beyond the franchise boundaries.

Status Monitoring and Standby Power

As a signal travels along cable, its strength fades until it is boosted by amplifiers scattered throughout the system. Because technical performance of the cable system tends to degrade as the equipment ages, some sort of remote status-monitoring system is important to track the performance of the amplifiers. It is also important to have an uninterruptible power supply in order to minimize disruptions during power dips and surges. But, even the best status-monitoring and maintenance system cannot prevent weather from sometimes affecting the supply of power to the system. Therefore, battery backup standby power should be provided for amplifiers where power is inserted into the system.

Cable Security Operating Experience

Security systems have been sold to cable operators in at least 63 major systems that eventually will be able to serve 3.7 million homes. In addition, cable security systems in 26 planned developments will someday pass 200,000 new homes. Exhibit 4-1 shows systems that are currently under development. The average cable security customer pays $906 for installation and $16 a month for monitoring. Cable TV security subscribership in the first half of 1981 grew at a rate of about 650 homes per month, from 12,334 to 17,290 connections, an increase of 3,955 (32 percent) since January 1, 1981. As of January 1982, systems are operating in the 17 cities and eight planned developments shown in Exhibit 4-1.

Cable Security Equipment

Only a handful of companies currently manufacture cable security equipment, but there soon will be nearly a dozen suppliers, including Jerrold, Pioneer Communications, and Scientific-Atlanta. The leading supplier is Tocom, which produces three systems that have capacities of 1,000, 3,000, and 128,000 subscribers. Most cable companies purchase a $57,000 computer that has an initial capacity of 3,000 subscribers and is expandable in 8,000-subscriber increments (at a cost of $40,000 per increment) up to 128,000 subscribers.

Tocom's central station computer polls each home every six seconds. In effect, the computer asks if everything is in order. Intrusion, smoke, and heat sensors are installed in the subscriber's home, along with a control

panel and a home terminal. Sensors are wired into the control panel. In an emergency, an alarm is transmitted to the central station where name, address, telephone number, type of alarm, and medical history are computerized and instantly printed out.

The equipment of other manufacturers works a little differently. The CableBus system uses less bandwidth and polls more slowly, which makes it more compatible with existing alarm industry equipment. Another manufacturer, Control-Com, has equipment that works even with one-way cable systems. It uses regionalized pole-mounted microprocessors to collect and poll information from the home. Those microprocessors, in turn, are polled by a master computer that relays alarm information to the headend. This technique solves the noise ingress problem. Detroit-based Datavision concentrates on providing security to condominiums and apartment complexes. General Instruments' Jerrold division is developing a "frequency agile" system that will use several different return frequencies to eliminate noise ingress problems.

The Syracuse Test

Rogers Cablesystems conducted a free, 1,000-home test of cable TV security in Syracuse, N.Y., from October 1980 to October 1981. Randomly selected and volunteer homes throughout the city were given smoke alarms and emergency panic buttons. During the course of the experiment, 472 police calls and 769 fire alarms emanated from the test homes as follows.

Police	Fire
73 valid emergencies	15 lives saved/property
288 minor incidents	damage averted
90 tests or child play	740 minor, environmental,
10 system fault	or friendly fires
11 appliance related	14 system malfunctions

The cable security alarm signals in Syracuse are transmitted directly to the city's public safety building, where the resident's name and address are printed on display terminals. Then a computer automatically places the dispatcher at the public safety building in telephone contact with the residence. This procedure takes very little time and cuts the cost of false alarms.

Syracuse fire chief, Tom Hanlon, says the system has proven itself and calls the experiment a success. City officials and consultants plan to evaluate the service to determine if it should be made available citywide. The evaluation will focus on system performance, public attitudes, price, elasticity of demand, and cost-effectiveness.

Public Policy Concerns

False Alarms

Improving public safety by encouraging the use of security alarm systems must be balanced against the potential cost and wastefulness

Exhibit 4-1
Cable Security Systems**

City	Cable Company	Startup Date	Security Subs	Residential Monthly Rate	Average Install	Franchise Area Homes
Altamonte Spgs, FL	Storer	11/80	220	$15.95	$ 760	19,800
Bergen County, NJ	Vision Cable	8/80	230	16.95	800	65,000
Columbus, OH	Warner-Amex*	12/79	3,850	15.50	1,050	120,000
Conyers, GA	Omni Cable	9/80	36	5.00	500	2,000
Dayton, OH	Viacom	1/79	1,240	16.95	675	70,000
Fitchburg, WI	Niall Comm.	6/81	8	14.95	650	3,000
Ft. Lauderdale, FL	Welkirk	2/80	889	15.95	900	110,000
Ottawa, Canada	Ottawa Cable	6/80	276	18.00	500	86,000
Park Cities, TX	Sammons	1/80	659	16.95	1,000	13,500
Peoria, IL	GE Cable	10/80	300	15.00	525	70,000
Rockport, TX	Rockport Cable	7/80	5	16.95	n.a.	5,500
S. Pasadena, CA	ATC	4/81	100	19.50	1,400	10,000
Spring, TX	Centel	5/81	75	15.00	1,250	35,000
Syracuse, NY	Rogers Cable*	9/80	1,000	Free	Free	75,000
Valparaiso, FL	Valparaiso	7/80	60	4.00	500	1,300
Victoria, Canada	Victoria Cable	10/80	76	19.95	450	50,000
Wainaie, HI	Ainamalu Corp.	3/80	99	17.95	500	14,000

*Denotes a non-Tocom system. Warner-Amex uses DTI Security equipment. Rogers Cable has developed its own hardware and software, which is manufactured by Harris Corp. Panic button fire alarm monitoring is free in Syracuse for one year under terms of Rogers' cable franchise.
**Source: Paul Kagan Associates, *Cable TV Security*, Carmel, CA, 1981. Used by permission.

resulting from possible increases in false alarms. As the percentage of homes with alarm systems increases, inevitably false alarms will increase as well.

Most cable TV systems that offer burglar and fire alarm services mitigate the false alarm problem by using a telephone call-back procedure. When an alarm signal is received at the central station, the monitoring operator immediately telephones the home. If there is no answer or the homeowner gives the wrong identification code, the proper authorities are immediately notified and dispatched.

A January 1980 U.S. Fire Administration study entitled "Remote Detections and Alarms for Residences: the Woodlands System," by David Moore, concluded that there "appears to be a trend of fewer fire losses" in Woodlands, Texas, homes that have the Tocom system. The study noted, however, that statistically significant conclusions could not be made on the system's effectiveness because the number of fires in the sample was too small.

Competition and Access

The existing alarm industry views cable TV as both an opportunity and a threat. The public's positive perception of cable and the cable industry's proven marketing prowess could help the alarm industry, which has long been plagued by a poor public image. Unlike many of the small alarm dealers in a community, cable operators have credibility and a firm financial foundation. Their multimillion dollar investment guarantees a long-term relationship with the community. They see an opportunity to bring to the security industry the maturity it has not yet attained on its own.

Because most cable companies lack the technical and operating experience of alarm companies, and the alarm dealers lack the marketing capabilities and capital of cable, joint ventures would appear to be an attractive option to both industries. In many cities, however, the alarm industry is guarding its position in an effort to preempt cable from being anything more than a carrier of alarm signal transmissions.

Alarm associations in Indianapolis, Indiana, Jefferson County, Kentucky, and Nashville, Tennessee, have successfully lobbied to prevent cable companies from providing security alarm services. In other communities, such as Omaha, Nebraska, and St. Louis County, Missouri, alarm dealers have threatened lawsuits against both cable companies and municipal franchising authorities. They claim that the cable franchise is a *de facto* monopoly giving the cable operator an inherent competitive advantage—the ability to advertise at lower rates and to use entertainment-related revenues to subsidize security services.

Omaha alarm companies have gone so far as to claim the city acted beyond its authority in granting the cable company the use of city rights-of-way for the provision of alarm services. Alarm dealers emphasize that cable franchises often bar cable companies from the sale and repair of TV

receivers, leaving that business to established TV repair companies who already provide the service. They argue that cable should serve as a transmission facility and leave installation, monitoring, and service to the private security business. In effect, alarm companies want access to the cable system on the same terms for all potential users.

The issues raised by the alarm dealers pose a number of technical, economic, and public policy questions that are difficult to resolve. First, the current state-of-the-art may allow only for a limited number of alarm companies to tie their central stations into the cable system. Second, a cable company risks liability and damage to its reputation by doing business with a poorly managed or undercapitalized third party. Third, the degree to which municipalities may impose common carrier[1] status upon cable (if at all) is unclear in light of conflicting court decisions.

Recently, New Jersey Bell Telephone petitioned the New Jersey Office of Cable TV to assert common carrier jurisdiction over cable security service when Cablevision of Bayonne requested certification to begin construction. New Jersey Bell asked the cable office to exercise to "the full extent" of its authority, "including the incorporation of the public utility rate, cost and service principles, if appropriate, to insure maximum regulatory parity in the treatment of regulated suppliers of two-way communications services." Cable companies and their associations argued in reply that security is a nonessential service and that cable has no monopoly power either to discriminate among potential recipients or price its services excessively because such services are already available in the marketplace.

In the years to come, conflicts in the cable security field may produce rulings and precedents that will refine the legal status of leased access to cable and of the cable operator's exclusive right to offer services that others may also wish to offer over the facility.

[1]Common carriers are service providers who are required by State and Federal regulators to allow access to their facilities on a first-come, first-serve basis and who may not discriminate in pricing. Moreover, common carriers are prohibited from using their own facilities to deliver their own services on a preferred basis.

5

Institutional Networks

By

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Chapter 5: Institutional Networks

An institutional network is a cable network, separate from cable subscriber services, that provides nonentertainment transmission services for businesses, public agencies, and community institutions. Most often, an institutional network uses a separate cable, which passes through a limited area of the municipality; including commercial clusters and municipal, education, and health facilities. An institutional network's path may parallel the subscriber network partially or completely, or the subscriber cable may include dedicated bandwidth to supply institutional transmission services.

The concept of a special institutional cable system grew out of the cable television industry's recent expansion into major urban areas. Cable operators, searching for new services and sources of revenue, were able to take advantage of technological innovations that allowed cable systems to build high-capacity, two-way systems with computer switching capabilities. Thus, cable systems could potentially serve as information pipelines in an urban area, transporting data, video, and voice to discrete locations passed by the cable. To conserve capacity on the subscriber cable and to limit the number of additional expensive plant miles built to carry institutional services, cable operators began to look at building a separate cable simultaneously with the subscriber cable.

Institutional network design allows switching at the headend so that transmissions originating on the institutional network can be delivered to the subscriber network when desired. Transmissions can be "scrambled" as well, so that only designated locations will receive the information. Thus, transactions, records, videotapes, and "phone" conversations can be delivered only to the institutional user for whom they are intended.

The birth of these new institutional networks coincides with the rise of distributed computer networks which are supplanting time-sharing systems keyed to large mainframe computers. The use of microprocessors throughout a system provides both increased memory and a higher total transaction rate. Institutional networks have emerged as a possible delivery mechanism for these new distributed computer networks.

As of early 1982, a large number of institutional network commitments had been made by cable companies, and development is underway. The few existing institutional networks are not fully utilized, however, and in most cases there have been no firm estimates of the nature and quantity of traffic to be generated.

Noncommercial Institutional Network Services

It is too early to tell if institutional networks will be built with the level of capacity predicted. Cable's advantage over other transmission technologies is its multiplicity of channels and its capacity to carry broadband video signals. It can also carry high-speed data at significantly reduced

error rates. A brief description of proposed applications for institutional networks follows.

In-Service Training

Using a combination of video materials and cable's interactive potential, the need for employees to travel to training sessions may be significantly reduced. Prepackaged video training materials used in conjunction with simultaneous data, audio, or video hookups can allow standardized training to be delivered while workers remain on the job. For instance, a National Science Foundation/Michigan State University report states that in firefighting, daily training is the norm. Training officers' efforts are often interrupted, however, by fires and emergency calls. Also, special firefighters' schedules complicate training and recordkeeping activities. The report concluded that two-way cable is effective for higher firefighter instruction and that the cost of using two-way cable, under most circumstances, is lower than self-study or lecture methods.

Law Enforcement

Institutional networks can serve as the transmission medium for numerous police functions. In New York City, a facsimile system transmits fingerprints, mugshots, and bail bonds. In Philadelphia, 26 precincts and district headquarters are linked to a studio in the police administration building. Three times a day, at shift changes, training, policy changes, directives, and "wanted" bulletins are communicated. Training tapes and films are transmitted at other times of the day. Closed-circuit arraignments are carried out from certain outlying district stations, making it easier to comply with a State law that requires arraignments to occur within six hours of incarceration. Although these examples do not use cable institutional networks, this type of communication is well suited to institutional network application.

Law enforcement officers can also communicate with specifically targeted populations over the institutional network, allowing public education and community relations efforts via cable. For instance, officers can "visit" classrooms, senior citizens, and retailers, providing information on burglary and assault prevention, alcohol abuse, narcotics, and shoplifting.

Remote Video Surveillance and Security Systems

Remote video surveillance is a security function well suited to cable. Cameras can be placed in strategic locations, with the video signal transmitted to a control center over the cable. Remote-sensing devices designed for intrusion monitoring and fire detection can be installed in institutions and businesses on the cable, and their signals can be monitored by a control center. These types of services are being made available on subscriber networks as well. (See chapter 4.)

Status and Control Services

Telemetry, or electronic monitoring, is now being used in a few cable systems to test its efficacy in water level and usage monitoring, residential utility meter monitoring, energy load management, and sewer pumping and treatment facilities control. Plymouth Township, Pennsylvania, uses Tilbury Cable Company's cable network for an Interactive Systems 3M-designed, automated microprocessor-controlled sewer pumping station monitoring system. The use of cable insures constant monitoring and virtually eliminates false alarms common to systems that use leased telephone lines. Likewise, the city of Valparaiso, Florida, controls 17 pumping stations in its water system via the cable network.

Industrial parks, factories, and high-technology industries passed by an institutional loop could all benefit from substantial energy savings with a cable-run energy management system. Municipally run utilities could experience substantial savings by offering peakload management over the cable system.

Most energy management and telemetry experiments are currently being conducted on the subscriber network, however. They are discussed in more detail in chapter 3. The convenience of the subscriber network for such types of services argues for the insertion of the institutional network services on the subscriber cable or for a fully parallel institutional network; however, this configuration is cost-prohibitive in many communities.

Delivery of Services to Isolated Populations

In every urban area, groups of individuals live in relative isolation, with limited transportation and limited incomes. These include senior citizens in senior homes, juveniles in institutions, handicapped citizens in institutions, and citizens who are hospitalized or have limited physical mobility. Many special institutional network services can be offered to these populations. Agencies that provide municipal services to these groups can be linked directly to the institutions, making it possible for caseworkers to make more frequent "visits."

In many cases, services can be delivered electronically. Medicare and food stamp certification, Social Security information, housing information, bus schedules, and notices of special hearings or events are examples of the types of services which could be delivered at low cost over the institutional network. However, before "teleservices" become commonplace, techniques to safeguard client privacy will have to be implemented.

Isolated populations can originate messages and programming over the network to other institutions and to subscribers. A case in point exists in Reading, Pennsylvania, where for several years senior citizens have created live two-way video programming between senior centers, high schools, city departments, and home viewers to discuss issues, have sing-alongs, or simply talk with each other. This programming is "open" to subscribers because their cable system does not use scrambling techniques.

Social Services Administration

In addition to the active service delivery described above, social services can use the institutional network to relieve the paper transfer of such data as client eligibility, payment, tracking, and attendance records. Using electronic data processing for such tasks can allow rapid retrieval at any site connected to a departmental database. With the addition of facsimile capability, signatures, forms, and other documents that need to be verified also can be handled via the institutional network.

Database Delivery

Automated systems for circulation and cataloging of information can easily interface with a cable TV network. Public libraries have access to databases and specialized information sources that can be even more valuable when linked to other institutions that either use or provide data. Because libraries have traditionally been in the information business, they are often the lead agency in coordinating the municipality's marriage with cable technology.

As institutional networks develop, it is likely that geographically dispersed public agencies will interconnect both to meet their own operational needs and to transfer information to other units of government. New databases will be created to centralize information on such subjects as assessments, housing, public assistance, and census data. Access for institutional terminal points to dedicated municipal channels will allow swift information access at lower transmission costs than traditional leased phone lines.

Major users of the institutional network are expected to include educators and health institutions (see chapters 8 and 9 for more information on their uses), government agencies, and local commercial institutions that depend on computerized information and swift and accurate transfers and responses.

Commercial Services

Data Applications

In the beginning stages of any institutional network, most commercial applications are likely to be data transmission services. The transactional businesses—finance institutions, retailers, and the travel industry in particular—depend on the transfer of specialized information to geographically dispersed branches or retailers; such functions are well suited to cable institutional networks. The cable industry may also be able to reach the largely untapped market of small, local businesses with growing data processing needs that thus far have been "priced out" of data processing services.

Facsimile transmission services, as well as electronic mail and file retrieval systems will be directed at organizations which retain large

volumes of records or require extensive paperwork. There are a number of "store and forward" methods in which documents can be handled electronically. At this point in the development of interface technology, however, most facsimile machines are configured to operate on dial-up telephone lines.

Video Applications

Video applications generally will require the greatest demands on bandwidth and dollar and human resources. Video teleconferencing permits remotely located groups or individuals to communicate, with savings in time and transportation. In addition to an interface device and a special room set aside for teleconferencing, standard control units provide for voice-activated video screen displays on receive and camera-activated transmit, with a rear- or front-projection screen. The full video aspect of teleconferencing permits transmission and exchange of graphics, in addition to permitting full visual contact between teleconferencing parties. Slow scan teleconferencing permits high resolution images to be transmitted, but it is not possible to follow rapid movement.

Most video teleconferencing is presently carried out in two modes. The first is transmission to hotel meeting rooms and conference centers by occasional users, such as sales organizations, for new product introductions or sales meetings and by associations, to reach their membership, and for training. The second is regularly scheduled teleconferencing by individual private corporations, many of which have their own facilities. Teleconferences in the first category are usually beamed by satellite; those in the second may use terrestrial telephone lines or satellite.

The basic signal path for satellite video teleconferences is outlined as follows:

- Point of origination, to
- Satellite station, to
- Satellite transponder, to
- Satellite stations, to
- Viewing sites.

At origination sites, an institutional network might well provide an alternative to the microwave or telephone route to the uplink. At the receiving sites, in addition to providing a similar alternative route, the institutional network can connect additional local receive sites to extend participation in the teleconference.

Marketing and Staff

Communications managers are the first line customers for institutional network services, and to date they have demonstrated a "show me" attitude toward cable television. These professionals are looking for around-the-clock transmission capability, dependability—their operations will be seriously impaired if a system is "down" for long—and service stan-

dards equivalent to, or better than, those of the telephone companies.

Arguments for carrying out a needs ascertainment (described in chapter 10) apply equally to public agencies and potential commercial customers. Market research aimed at identifying potential users can aid network management to set priorities for service applications and to design those services to accommodate existing equipment and operations. Beyond the ascertainment, institutional network management must maintain an ongoing public relations/marketing campaign to educate and inform potential customers.

Cable television has developed quite differently than those communications technologies with which it is converging. Service has focused on signal amplifiers and passive devices (and only recently, more sophisticated converters), and marketing has been aimed at selling reception service and entertainment programming door-to-door to the residential customer. Institutional network management faces weightier service and marketing concerns. Highly qualified personnel will be required to work closely with customers as well as OEM staff (original equipment manufacturer) on interface and terminal equipment problems.

Ratesetting

Most franchise proposals will offer to provide transmission and certain terminal equipment on the institutional network to public buildings at no charge. Many cable companies, however, are struggling with ratesetting policies for commercial use of the network. To date, rates for nonentertainment services offered on cable television are often set arbitrarily. Until several institutional networks are operational, rate patterns will probably not emerge. Rates bid by competing applicants in Prince George's County, Maryland, are shown in exhibit 5-1.

There are several approaches to setting rates. One is to charge a flat rate, especially for video transmission, on a monthly or yearly basis. For shared-channel situations, either video or data, a flat rate might be less appropriate because it would not reflect levels of use. A schedule based on volume transmitted, that is, units of data or hours of video, would probably be more equitable. Just as utilities set "peak load" rates, institutional network pricing might be keyed to business hours or "prime" user time.

In addition to rates for time or bandwidth, institutional network management must also set rates for leasing interface and terminal equipment and offering technical assistance to customers.

A ratesetting philosophy must support any institutional network tariffs. In the case of a wholly separate institutional cable, in which the cost of the plant is totally chargeable to institutional services, proportional rates could be based on bandwidth used as well as the number of terminals used. If institutional services are provided on a dedicated portion of the regular subscriber network, a workable plan may be to base rates on equipment costs and an amortization period and to set a reasonable internally

generated rate of return on investment. A portion of the margin may be allocated to general system support as a simple percentage, without corresponding to frequency of transmission or amount of plant utilized.

Most telephone company tariffs are keyed to plant mileage, but this approach does not seem valid for cable TV institutional systems. A twisted pair connection links every user location directly to a telephone company switching site; while with cable television all of the system is used in each transmission; the system can serve 100 customers as easily as five.

Cable management must chart a careful course in developing dependable, cost-effective services, progressing from general to individually tailored packages as it moves through the "shake-down" period in developing this new technology. Skilled, responsive staff and competitive rates will be two elements necessary for success.

Exhibit 5-1

Sample Rates for Commercial and Data Use of an Institutional Network

Applicant	Installation	Channel Time	Other
1	First outlet: Cost plus 10 percent Additional outlet: At cost	$1,000 per month	—
2	No commercial use of network	—	—
3	Time and materials	Video: Negotiable Data: $140 to $295 $210 to $950 per month*	Extra modems $85 monthly
4	cost plus 10 percent	Video: Negotiable Data: $200 to $1,800 monthly	Teleconference $25 per hour Switcher $30 per hour
5	$25 (noncommercial also)	Video: $25 per hour Data: "at cost"	Telephone: 80 percent of telephone service rates
6**	n.a.	n.a.	n.a.
7	First outlet: Free Additional: Time and materials	Data: 3 levels competitive tariff	—
8	$14.95	Various video: $429 to $858 per month Data: $103 to $296 per month	P.T. video: $8 to $16 per hour $4 to $9 per hour

*Asynchronous $140 to $295; synchronous $210 to $950, includes two modems.
**Institutional network rates omitted.

Cable, Telephone, and Local Loops

Because the switched voice system is found in practically every home and office in the country, it will be difficult for cable TV institutional networks to compete with POTS—plain old telephone service. However, many private corporations and public institutions are examining ways in which they can control telecommunications expenses, most of which is telephone traffic. Institutional cable bandwidth capabilities can facilitate the development of private telephone systems for both corporate and public entities of scale. In addition, data that travel locally through telephone lines can easily be carried on coaxial cable.

The telephone local distribution network or local loop that connects home and workplace to switching centers was designed to meet the capacity requirements for telephone conversations. Data and voice can now be transmitted over satellite and microwave networks for thousands of miles at extremely high speeds, only to reach a bottleneck in the last mile at either end. Moreover, conventional telephone wires cannot transmit video.

Since the early 1970's, when Federal regulations were eased, many specialized common carriers have developed, using satellite, microwave, and terrestrial links to provide business and data transmission services. The "long-haul carriers" that provide diverse long-distance telecommunications services are becoming well known; such as MCI Communications, Satellite Business Systems, Southern Pacific Communications, Telenet, Western Union, and Tymnet. Tymshare, Inc., is what is called a value-added carrier: it adds computers to existing transmission links to provide enhanced services to its customers. Applications performed over the Tymnet network include computer timesharing, credit card processing, inventory systems, accounting and statistical analysis, database management, message switching, flight planning, and word processing. MCI, another long-haul carrier, uses a microwave network to provide telephone services. Most of these carriers must depend on telephone company local distribution and thus are limited to low-speed transmission rates of no more than 9,600 bits per second.

The cost of upgrading telephone local loop capacity nationwide will be enormous. It is estimated that local telephone companies will need decades to upgrade to broadband capability. Thus, long-haul common carriers providing data and voice services are seeking alternatives to conventional analog telephone local loops. They wish to secure greater bandwidth and to accommodate high data rates, fast response time, videoconferencing capability, and rapid facsimile transmission. Cable television may provide one local loop alternative.

In 1981 the first major test using a cable television system as a "last-mile" link was undertaken by Local Digital Distribution Company (LDD), owned jointly by M/A-Com, Inc., and the Aetna Life and Casualty Company. Satellite Business System's SBS-I satellite was used to transmit data between San Francisco and New York City. Tymnet assisted in customer

interface in each city. Manhattan Cable TV in New York and Viacom in San Francisco provided the local loops. Test customers were brokerage firms, banking institutions, communications companies, and computer service companies, all of which had offices on both coasts. Services tested included high-speed, freeze-frame video; high-speed facsimile transmitted at 56,000 bits per second kb/s, and computer exchanges at data rates ranging from 9.6 kb/s to 1.5 million bits per second (Mb/s). The experiment was successful, and results showed that cable could be used effectively for local data distribution and that it could handle high speed data with a very low error rate.

Institutional networks are coming to be regarded as a potentially efficient component of a multilevel data networking system. The national link is already in place, through 10 domestic satellites. Regional interconnection schemes are still in the planning stages, however; until cable systems are fully interconnected with other regional and national carriers, the institutional network's utility as a data carrier will be limited.

Institutional Network Design and Capacity

Currently, there are three basic institutional network design configurations: dedicated bandwidth on the subscriber ("A") cable, a separate "B" cable that fully or partially parallels the subscriber cable, and a separate cable that passes only a central district of the franchise area, usually the business district. In each case, the institutional network would be capable of sharing certain programming with the "A" cable by redistributing a signal from one cable to another at the headend or a hub when desired. This capacity, however, is usually limited. Placing institutional network services on the "A" or "AA" cable is usually proposed when the subscriber network will be a dual 400 MHz system, capable of carrying 108 video channels. The parallel "B" cable design is much the same, except that a full cable is reserved for institutional uses. The separate "B" cable may be proposed to carry a full 400 MHz or may have less capacity.

Upstream and downstream traffic is "split" between frequencies on the cable. The traditional "mid-split" mode affords greater upstream capacity than the downstream spectrum. The new "high-split" technique allows equal capacity in both directions and is advocated by those who predict that there will be no more traffic in one direction than in another.

The high capacity or bandwidth of a coaxial cable system allows it to carry multiple video signals simultaneously. Television signals require a bandwidth of about 6 MHz, whereas telephone requires only 4 kHz. Digital data signals require significantly less bandwidth. Thus, a cable system can support a variety of two-way signals. Moreover, cable is cheaper to install than conventional wire, and many users can tap the same coax rather than requiring a twisted pair connection from each user terminal to each other's terminal, typical in conventional baseband installations. Coaxial cable is

also easier to repair than telephone lines. If a link is cut at any point, repair merely entails splicing one length of cable rather than tracing a fault through numerous pairs of twisted wires.

Institutional network designs have tended to incorporate limited switching capacity on the local level. The ability to route signals from one terminal point to another and to switch video, audio, and data signals to specified channels is critical to a high-traffic network. If there is a high demand for data services, it is not certain whether many of the proposed cable network switching systems will be efficient.

To interface office equipment and computer terminals with the cable network, a building must be wired internally with coaxial cable. Many older public buildings and schools across the Nation have been wired with baseband cable, which has about 50 times less capacity than coaxial cable.[1] This automatically eliminates the capability for teleconferencing, monitoring, and centralized traffic control, because baseband cable cannot handle most of these functions. Buildings wired with baseband cable, therefore, face the relatively expensive prospect of internal rewiring.

Some commercial businesses, including large office buildings, have also been wired with baseband systems, which cannot pass the higher frequencies used over coaxial cable. Thus, these local area networks, or internal wiring systems that connect business machines to each other, cannot hook into the cable system without expensive rewiring.

User Equipment Packages

The availability of channels is only one element in the creation of a viable institutional network. For high-speed data transmission or telemetry applications, specialized terminal hardware and interfacing equipment are essential. Instructional television and video teleconferencing require additional studio equipment and terminals as well as related staffing. These resources may be provided in part by the cable companies or may be purchased or leased by the institutions themselves. Either way, user equipment will represent a significant capital cost to activating services.

Institutional networks have become a standard component of the service offerings of newly franchised cable companies. Most companies offer free installation or hookups to public buildings and do not charge public and nonprofit agencies to use transmission facilities, although they do expect to charge commercial users. Offerings by bidding cable companies to supply interface devices, terminal equipment, and production facilities necessary to use the network have varied widely. Exhibit 5-2 illustrates the equipment packages proposed by the eight applicants in the Prince George's County, Maryland, franchising process. (Prince George's County is in the Washington, D.C., metropolitan area.)

[1]Baseband signals are transmitted without modification and carry only one signal at a time. Baseband signals (direct current) cannot be sent over lines using amplifiers, as in cable television systems.

Interface Equipment

In addition to "peripherals" such as telephone instruments, CRT's, printers, etc., data communications networks use two other types of devices: multiplexers and modems.

A multiplexer combines data from various sources such as computers, word processors, and terminals using various processing schemes to produce a single data stream. The word "modem" is an acronym for the words modulator and demodulator. After the multiplexer has combined all inputs into one data stream, the modem conditions the data for transmission by changing its characteristics so that the signal is compatible with the transmission medium. After transmission or upon reception, the modem

Exhibit 5-2
Sample Terminal and Production Equipment Packages

Applicant	Terminal	Production
1	100 modulators 100 converters 25 computer terminals 5 character generators (no modems)	3 vans (educational/institutional/municipal) 1 studio: municipal 3 portapaks
2	2 "Telidon-type information provider units" 10 receiver terminals (no modulators/converters)	
3	104-channel converter to each institution, 2 modems to each data user (no modulators)	1 studio, FM studio: PG College 1 Van, FM studio: county 1 Van: Board of Education
4	Modulators to all regular producers 10 modulators for loan 6 pair data modems 50 interactive terminals 1 Misar switcher for loan (no converters)	1 Portapak, Character generator Takoma Park 1 Van & Studio Equipment: PG Community College
5	"A variety" of modems/modulators (no converters)	
6	Converters to all institutions Modulators to regular producers (no modems)	1 studio: PG Community College 1 studio: county 11 portapaks: high schools
7	"A $60,000 pool" of modulators/converters/interactive terminals/data modems/terminals	Equipment: PG Community College
8	Modulators to regular producers. 2 modems to regular data users. 10 modulators/10 modems: Interactive converters to all	1 studio: county Equipment: PG Community College 1 library viewing center

reconfigures the received signal into the original data format. A modem generally consists of a transmitter and a receiver, giving it the capability to transmit and receive data using various modulation schemes.

A broadband institutional network is protocol-transparent and one cable can handle different protocols and interfaces. Interface devices can cost between $500 and $7,500 each, depending on their data rate and multiplexing design. There is a moderately declining cost curve for interface devices. Interfaces are defined by accepted specifications which delineate the data format, voltage, impedance, etc., plus various control signals which coordinate the modem's operation with the attached data equipment.

Planning for Utilization

To determine a government's service needs, officials should carry out a needs assessment focusing on:

- Work objectives;
- Information flows;
- Bottlenecks encountered;
- Projected changes in operation;
- Anticipated future needs;
- Modes of communication employed;
- Types of hardware in use;
- Time and duration of transmissions; and
- Present costs for hardware and transmission links.

Officials should also perform a cost/benefit analysis of using broadband cable. Most public institutions use the telephone system as their transmission path for data and voice communications, and most existing equipment has been designed to interface with that system. Therefore, the first step in an analysis might be to determine the savings in telephone line charges, particularly dedicated line charges, if service were shifted to an institutional network. (See chapter 10.)

As institutional networks are activated, public officials can look to cable as a vehicle for such services as electronic mail, facsimile transfer, energy load management, traffic control, and pumping station monitoring. The bottom line will be whether an institutional network can provide the same level of service at a lower cost, or better service at about the same cost.

Policy Issues

Several issues are emerging from the arena of the franchising and refranchising processes. One concerns the regulation of institutional networks. In **NARUC II**[2] the FCC attempted to preempt State public utility regulation of cable television. Challenged by the National Association of Regulatory Utility Commissioners, the court ultimately held that the FCC cannot preempt intra-state, point-to-point, nonvideo traffic. Thus, while

[2]*NARUC* v. *FCC*, U.S. Court of Appeals, D.C. Circuit, 1978.

some aspects of institutional network operations could be regulated by State PUCs—including rates—no States have exercised this option.

As "give-aways" of free channel time and equipment to public institutions have escalated, and as more and more cable companies compete for fewer remaining franchises, there has been a growing recognition that provision of free services to municipalities may constitute a hidden subsidy which impacts on subscriber rates. Hence, many franchising authorities are encouraging the implementation of institutional networks as profit centers, so that revenues from commercial users will subsidize use of the network by public institutions, and subscriber rates will not be affected.

Summary

Plans for institutional networks are receiving increasing attention during evaluations of cable franchise proposals. In evaluating institutional networks, most decisionmakers consider the following elements:

- Plant mileage and channel capacity;
- Institutions served;
- Capital expenditures;
- Management plan;
- Policies and rates;
- Dedicated terminal and production equipment available from the company to users.

Currently, both public officials and cable operators will find it difficult to make firm commitments on utilizing or developing institutional network services because there is so little actual experience to draw from. However, many institutional networks are scheduled to be activated by the mid-1980's. As businesses, public institutions, and home subscribers become more familiar with data transfer and digital information uses, these networks will have an increasing impact on how we work and communicate in the years ahead.

6

Community Programming: Public Access And Local Origination

Contributing Authors
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Chapter 6: Community Programming: Public Access and Local Origination

From its beginning, cable's value to consumers was its multiplicity of channels. Even on twelve-channel systems, some channels are usually blank. This abundance of channel space led the industry and the Federal Communications Commission (FCC) to explore other services cable could offer. One of the most interesting options, both to the regulators and to cable entrepreneurs, was community programming.

Background

In the late 1960's and early 1970's, television production equipment that was low cost, portable, and easy to operate became readily available and affordable. Schools, universities, hospitals, and other institutions began to invest in this equipment, realizing that video could have many applications in education and public information. Most early interest was in closed-circuit use of video (or "in-house" use) because the equipment did not create a quality of signal that could be broadcast over conventional television. However, the FCC recognized that cable could transmit locally originated video signals not only to other buildings but to private homes. Even more important, cable could transmit programming made on low-cost equipment that was not broadcast standard without significant technical problems.

Cable operators, too, were interested in originating programming from local systems, realizing that many early cable markets had no local broadcasters. Local cable channels could carry advertising to generate revenue on local programming produced by the cable operator.

In 1972, the FCC promulgated rules for the cable television industry that required cable systems with more than 3,500 subscribers to originate programming of their own. In addition, the FCC, in an effort to insure that nonprofit programmers could use the "abundance" of cable television's channels, adopted "access" rules that required cable systems with more than 3,500 subscribers to make at least one public, educational, government, and leased channel available to the public on a first-come, first-serve, nondiscriminatory basis. The channel to be programmed by the cable operator became known as the "local origination" channel; the other channels (or channel; the rules were clarified in 1976 to allow a composite channel) became known as the access channels. The major difference between local origination (L/O) and access channels was one of control. The local origination channel, according to the FCC, could accept advertising and could be controlled for content, production values, and revenues by the local operator. The access channels (public, educational, and government) were to be noncommercial, and a minimum of five minutes of free production time and channel space were to be available to any group or individual

upon request for any noncommercial message. Leased access was to be a hybrid—allowing commercial interests to lease space on a channel for commercially supported programming.

By 1976, some local governments, educators, and individuals had tried to operationalize the FCC's access requirements on their local cable systems. Several local operators also had experimented with local origination, by setting up studios, hiring a small staff, and producing local programming.

Local origination, however, with its required staff and relatively expensive facilities, became a financial burden. The economy took a downturn in the mid 1970's that forced many local origination operations to close shop. Access users faced resistance from local cable operators to their programming content and styles and their demands for facilities and airtime. The FCC rules were too ambiguous to clarify definitively whether the operator could refuse programming on the basis of technical standards, length of program, political bias, or other reasons.

The initial failure of local programming to become a commercially viable service, and the growing resistance of cable operators to citizens' demands for access, culminated in two lawsuits filed by Midwest Video, a cable operator, against the FCC claiming that the FCC had no jurisdiction to impose origination requirements on cable operators. The Supreme Court upheld Midwest Video's claims in 1979 and the origination and access requirements were struck down.

Ironically, however, by then the economy and the cable industry had recovered, and access users across the country had begun to make access programming work. Local origination was doing well in certain markets as well. The cable business was becoming viable for major urban markets as a result of pay TV services, introduced in 1975, and was making unprecedented profits for cable systems by 1978. Local governments, more educated about cable than ever before, supported local programming requirements for the same reasons that the FCC had in 1976, and the access and local origination requirements that were struck down on the Federal level reappeared in most new franchise ordinances on the local level.

The basic philosophy of access and local origination that sparked the interest of the FCC, cities, and user groups has come to be known as "narrowcasting": the ability to target local programming to small, special interest audiences rather than trying to achieve a mass "broadcast" audience. Local programming over cable, then, has evolved under the narrowcasting philosophy, and the availability of multiple channels on a cable has allowed local groups and institutions to experiment with several types of community programming.

Community Programming Forms: Past and Present

Just as cable television service in general has progressed from relatively simple retransmission of broadcast programming to a complex

and sophisticated service, community programming has progressed from a simple concept to a complex one. Early attempts often involved minimal video equipment, little or no money, and volunteer labor. Programs were often city hall proceedings, little league sports, talk shows, religious shows, and documentation of special events, such as parades. Although these types of programs remain central to local programming efforts today, just as retransmission is still central to cable service, the interests of local programmers have expanded to include two-way "teleconferencing," digital and text programming, instructional programming, and many other new forms of local entertainment and local information.

Government and educational users of cable, discussed in more detail in chapters 7 and 8, have emerged as pioneers in using cable for broadband institutional information delivery. Their interest is no longer limited to public information television programming, but rather has expanded to include experiments in traffic and energy monitoring, educational database retrieval, and electronic recordkeeping. All of these interests, however, stem from the continuing tradition of community programming over the access and local origination channels.

To an increasing extent, in newer cable franchises promising a multiplicity of channels and services and institutional networks, institutional programmers are going their own way. They have access to dedicated channels, equipment, and funds that far exceed the minimal levels envisioned by the FCC a decade ago. The public access channels remain to serve individual programmers and smaller special interest groups, whereas major institutional users, such as school systems, often now have separate dedicated channels and facilities.

The rest of this chapter discusses community programming management structures, including the traditional grassroots organization model and the emerging institutional or government-based management models, and gives some recent examples of local origination and public access programming. Exhibit 6-1 compares general characteristics of various local programming management models. Cable radio, an emerging option for community programmers, is also explained.

Company-Run Local Origination and Access

Cable company managed local origination exists in all parts of the country. Often, public access is merged into these local origination efforts. Companies often prefer this structure because the accountability for programming budgets can remain in-house. In smaller communities, local origination and access may exist on the same channel, may look the same to the viewer, and may not even be distinguishable in the minds of volunteers or interns who help operate the channel(s). In many cases, distinctions are irrelevant for all practical purposes, since the result is the same—community-oriented programs for subscribers.

Budgets for local origination are designed by local cable system pro-

Exhibit 6-1
General Characteristics of Various Local Programming Management Models

	Management Models			
	Independent Citizens' Organization	**Institution-Based Organization**	**Cable Company**	**Urban Access Management**
Nonprofit, tax-exempt organization	Yes	Yes	No	Yes
Board of directors selection process	Elected from members	Elected and/or appointed	None	Appointed by officials
Principal funding sources	Contributions from members* Grants Service contracts Cable company*	Institutional budget Grants	Cable company	Portion of city franchise fee Cable company
Paid staff	Sometimes	Yes	Yes	Yes
Volunteers/interns	Yes	Yes	Yes	Yes
Stable funding	Not always	Usually	Yes	Yes
Channel(s) programmed	Access	Access Leased	Local origination Access	Access

*Support may include in-kind donations of staff time, office space, and/or equipment.

gram directors and approved by the company manager and corporate headquarters. Because the corporation has sole discretion over budget increases or cutbacks, some critics of company-run local programming believe that there is guarantee of continued support. In recent franchises, therefore, some cities and companies have spelled out a yearly dollar amount to be allocated to local origination and access by the cable company.

Community producers and local organizations desiring to program the cable system are accommodated through the local origination channel. Often the company's local origination staff will produce their programs for them. Occasionally, local origination operations will allow community groups access to the company's studio and channel for independently produced program efforts.

Tensions have often surfaced, however, between access users, who prefer autonomy from the system management, and the local programming staff or system management, who seek to control content or appearance of independent programming. This tension is the most obvious weakness in a company-sponsored L/O or access effort. When control is not delegated to system users, they must conform to system management's standards, which are often far removed from the noncommercial purpose, intent, and budget of a program. For this reason, most communities prefer a separate access structure in tandem with a commercial local origination effort.

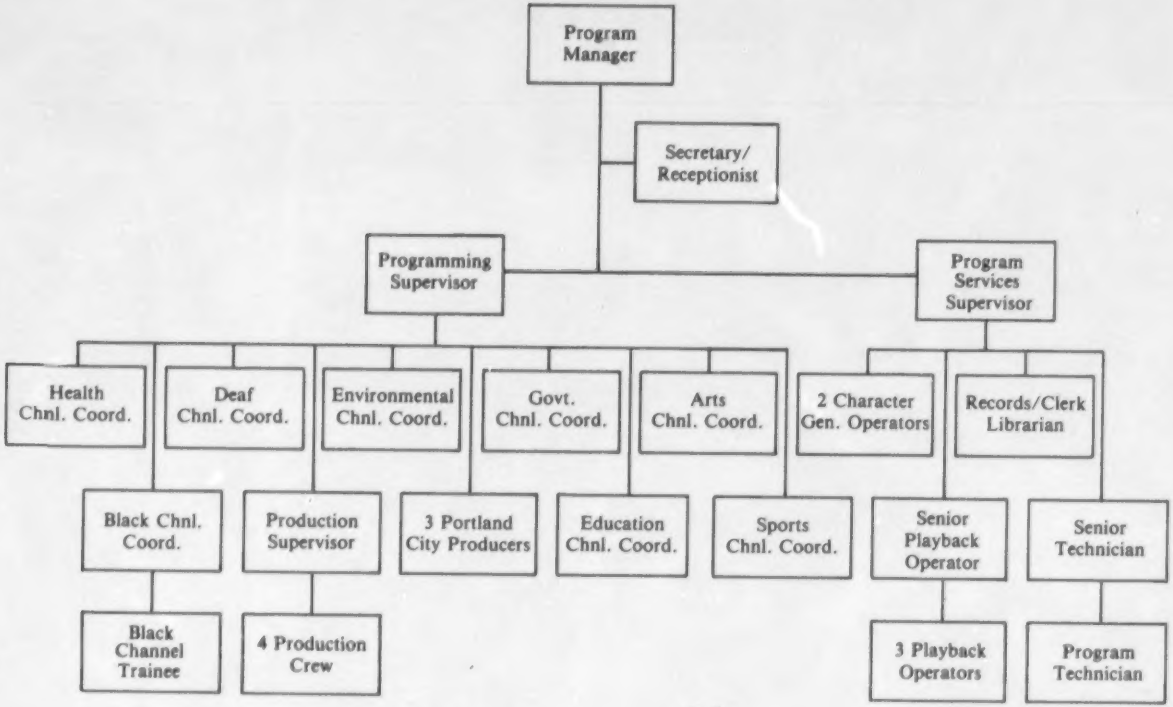
The size of the staff and levels of program management will vary greatly in cable company-run programming operations, depending upon the size of the community served, the scope of the company's programming intentions, and the degree to which the staff participate in access development. In smaller cities, staffs are usually small—one to five paid persons plus volunteers and interns. Salespeople are often added if the program operation is commercial.

In urban cable companies, staff and budgets are much larger, and the duties of staff allocated to community access and those allocated to local origination are usually kept distinct. Warner-Amex in Cincinnati proposed a local origination goal of 154 hours per week of local programs made by company staff. Year 1 staffing is projected to total 38 persons, with an increase to 67 projected for year 10. Operating budget projections begin at $349,000 in year 1 and rise to $2,626,000 in year 10.

A second example of a major proposed effort is that of Cablesystems Pacific of Portland. It commits a budget for a local origination staff of 30. Exhibit 6-2 shows the organizational staff structure as it appeared in the company's franchise proposal.

None of the above examples and projections includes the company's commitment to public access implementation, however; Warner-Amex in Cincinnati includes a $765,000 budget by year 10 for access and a staff of 15 to conduct workshops and to educate the community on the use of the 18 access channels available. Cablesystems Pacific's access proposal includes funds for three access coordinators and a technician, who will be paid by

Exhibit 6-2
Local Origination Staff Plan of Cablesystems Pacific (Portland)



the cable company but who will work for the Portland Cable Access Corporation, a city-appointed cable access management board. The company would also provide $2,747,000 for access operations over a ten-year period, which would supplement other access income.

In San Diego, California, Cox has had an active local origination channel since 1970. Their L/O operation functions much like a local broadcast station, with eight full-time production staff, four advertising representatives, and a technical staff. Its annual operating budget is approximately $600,000. They earn about $900,000 on local advertising. Local production, however, is not the mainstay of programming on their channel. They run a substantial amount of rebroadcast sports from the Entertainment and Sports Programming Network (ESPN) and USA Network, as well as

Exhibit 6-3 Sample Sayerville, New Jersey, Local Origination Schedule

Mon. 2/1/82 Wed. 2/3/82

6:00 p.m. *Channel Six Preview*—Descriptions of tonight's local origination programs.

6:30 p.m. *Rutgers University Forum*—On Monday, panelists William Liss, Jeff Sherb, and Jerome Aumente will discuss the future of communications. Learn about how the technical explosion in the media will affect the kind and quality of news and information available to both mass and specialized audiences.

6:30 p.m. On Wednesday host Roger Cohen will moderate discussions between N.J. Bell's Rocco Marano and Edward Nieder of AT&T and reporters Ron Stepneski and Sandy Duerr. The guests will be asked to voice their opinions on how the settlement of the antitrust suit of the U.S. Justice Department will affect the future of their company and the general public.

7:00 p.m. *Rutgers University Business Weekly*—In addition to the summary of business news in New Jersey, this week's Rutgers Business Weekly will look at the 20-year effort of historians and technologists to compile their extensive works and notes of Thomas Edison.

If you think you have a great idea for an invention, you can find out from patent attorneys what procedures you should follow before applying for a patent. Discover some of the ups and downs in the business of inventing with New Jersey inventor George Byrd.

7:30 p.m. *Take 6*—Tonight on *Take-6* Linda Benjamin speaks with Dr. Martin Schwarz, founder of a therapy designed to aid stutterers in controlling their handicap.

For those creative souls, Wendy Grubow introduces our viewers to the age-old art of glass in lead as she visits a stained glass emporium.

women's programming and other programs from ABC-Hearst, USA Network, and other sources.

In Syracuse, New York, Syracuse Cablesystems runs a local origination channel that uses a great deal of volunteer effort and community input. Two full-time producer/directors work with individual volunteer producers from the community. Community organizations, senior citizens, minority groups, children, and high school sports enthusiasts all have programming directed to them and produced with their cooperation. One local program, "Festival Italiano," is made up of news clips, brought from Italy, that are edited by a local producer. "Cable Sports Productions" is produced by high school and college students using a mobile van to cover sports events.

One unique programming concept at Syracuse Cablesystems is

To show that good things come in small packages, Steve Sefcik sees how much love is given in return for love; we meet miracle Mikey, probably the smallest dog in the world.

Almost everyone has a hobby involving collecting. Randy Kurlander exposes how fanatical some people become when he takes us to a baseball card exposition.

8:00 p.m. *Impact!*—Join host Ed Nash this week on Impact! as he discusses economic renewal in New Jersey with Edward Lenihan, chairman of the State Chamber of Commerce Economic Development Committee.

8:30 p.m. *The Final Score*—Watch Hoffman High School's basketball team battle the boys of St. Mary's as we highlight the game on this week's The Final Score. Also see the contest between the girls' teams of Matawan and Middletown South. Randy Kurlander covers the Cedar Ridge-Matawan wrestling match. The hot rivalry of the Old Bridge Middle School Salk and Sandburg is the subject of our Final Score feature.

9:00 p.m. *Home Dynamics*—Discover how to get the most food from the least amount of garden space by means of raised beds. The Home Dynamics series explores intensive gardening.

9:30 p.m. *Getting to Know You*—Find out more about the personal life of artists, performers, and prominent citizens on our new show Getting to Know You with Arlene Herson. Tonight Arlene talks with Lorna Luft, recording artist, Broadway and nightclub performer, and daughter of Judy Garland.

10:00 p.m. *N.J. Congressional Caucus*—U.S. Representatives Jim Courter and Matt Rinaldo discuss Federal spending and the national budget with David Stockman, director of the Office of Management and Budget in the Reagan administration, on the New Jersey Congressional Caucus.

known as "The Manager's Private Line," a call-in show featuring the general manager of the system and a guest. The general hospital in Syracuse does a popular series on health awareness, and the L/O channel also occasionally shows public access programs and films from the local library's files.

In Sayerville, New Jersey, Cross Country Cable launched its local origination operation in August 1981. It employs a staff of seven full-time and two part-time people and uses about six interns each semester. Their annual budget is approximately $200,000, of which about 10 percent is earned through advertising. Because the company has several systems in central New Jersey, much of the local programming on the Sayerville channel is regional and is cablecast on its nearby sister systems as well. These programs include "The Rutgers University Forum," a studio talk show done at Rutgers on regional issues; "Take 6," a magazine format show featuring community events, personalities, and leisure time features; and "The Final Score," a regional sports analysis program produced by Cross Country Cable (see Exhibit 6-3 for a sample schedule). They also do full-game coverage of high school and college sports with a nearby Cross Country system.

Public Access Centers

In the early 1970's, many small citizens' access groups formed to create utilization plans for the then-required access channels. They generally evolved in small- and medium-size communities, probably because few large urban areas were wired for cable before 1980. If community support and cable company cooperation were present, chances for long-term survival were good. So, although some of these efforts failed in the early years of access, others flourished and are still in operation.

Public access centers have generally been organized (a) when community people feel that their programming, fundraising, or management efforts are needed to make public access time a permanent feature of their system; (b) in the absence of a local programming effort by the cable company; and (c) in cities involved in the franchise or refranchise process, to illustrate desire for and commitment to access programming. It is important to note that access organizations almost always depend on a local "catalyst"—either a dedicated individual or organization—to get them started.

The kinds of activities in which an independent access organization is involved vary, depending on the other available programming resources in a community. If there is no local origination or institutional access facility, the access center may provide equipment and services to all potential programmers. Usually, it takes responsibility for production training, community education, and cablecasting. If a cable company has staff, equipment, and studios available for public access support, an independent citizens' organization may form as an access advocacy group that par-

ticipates in the production of programs, but that does not take responsibility for day-to-day management.

Equipment loan and technical training have been two principal functions of all access-facilitating organizations. Additionally, management of access involves the following:

- Maintaining a list of volunteers qualified to give others technical aid;
- Maintaining a group of qualified production workshop leaders;
- Educating the community on possible uses of cable channels;
- Developing publicity strategies to encourage program viewership; and
- Developing daily operating rules and procedures that include policies on equipment maintenance, scheduling, and channel use.

Exhibit 6-4 summarizes typical rules and policies of access organizations and cable companies involved in local production.

Exhibit 6-4

Outline of Access Management Policies Developed by Open Channel, Fayetteville, Arkansas

I. Programming Guidelines

Scope of program content areas to be developed, program review procedures, program warnings, definitions of prohibited content,

Policies on time limits, equal time, and response to political, religious, and controversial programs,

Policies on nonlocal programs, use of copyrighted material, tape labeling and credits,

Community outreach priorities,

Program scheduling, requests for time, regular programs, time-slot competition, intended audience, schedule setting

II. Use of Facilities/Personnel

Membership in organization, responsibility for equipment and facilities, equipment damage and report policies, equipment check-out procedures, use of facilities by out-of-town visitors, user abuse, mismanagement reports, hours of operation

III. Personnel

Volunteer work-off program, producer certification, apprenticeships, continuing education for producers, workshops

IV. Fees

Fee policy, repayment and billing, work-off for fees, charge for first production, protapak fee, studio fee, editing, personnel fee duplication fee, institutional contracts, in-kind contribution policy

V. Planning

Short-term and long-term goals, responsibilities to access movement

Typically, independent citizens' access groups take the form of non-profit, tax-exempt corporations that are open to membership. Exhibit 6-5 compares various structural features of three such organizations: Madison (Wisconsin) Community Access Center, Inc., Schenectady (New York) Access Cable Council, and South of Dayton (Ohio) Community Access Television, Inc.

Participation in these organizations is encouraged by keeping annual dues low and membership qualifications at a minimum. Typical of the desire for broad community representation on boards of directors is South of Dayton's by-laws request for participation from business, government, organized religion, neighborhood groups, libraries, youth, senior citizens, women's groups, service groups, social service agencies, and other identified organizations as approved by the members. Similarly, Madison's by-laws insure their board will include "racial and ethnic minorities and women" and reflect "geographic and socio-economic diversity."

These organizations' boards are autonomous from city politics, local institutions, and the cable company. However, cooperation and good relations among all these entities are goals reflected in many independent organizations' by-laws (e.g., cable operator appointment of a board member). All three organizations examined provide for continuity among their elected leadership through use of staggered terms or ancillary boards of directors. Organizational tasks are carried out by committees that assist the paid or volunteer organization coordinator. Those indicated in Madison's by-laws in Exhibit 6-6 are typical of committees operating in citizens' access organizations.

The franchise process in cities has recently led independent access groups to negotiate successfully for direct, ongoing support from the cable operator or city franchise fees. Most citizens' groups, however, such as those using 12-channel cable systems, are in cities where cable companies are not yet ready to rebuild the system or to renegotiate with the city for access support. In these cases, citizens' access organizations must take an energetic, creative approach toward building a secure funding base. Many access groups attract funding from diverse sources, so as to protect the organization against forced shutdown in the event that a single major supporter stops contributing. These sources may include local or national philanthropists, corporate gifts, fundraising events, and telethons. Local support is a necessity to independent access organizations, whether it comes in the form of cash, donations, space, equipment, or volunteer staff. Small fundraising efforts, such as bake sales or raffles, underscore the community nature of the organization.

Offering related video services might also be an attractive income-generating option to a local access group, provided they have the necessary resources. For instance, Marin Community Video of California lists workshops in microcomputers and use of video by therapists alongside its standard video production workshops in its fall 1981 newspaper. Their

Exhibit 6-5
Comparison of Organizational Structures of Three Independent Citizen Access Corporations

	Madison	Schenectady	South of Dayton
Annual dues	$4[1]	n.a.	Individuals: $ 1 Nonprofit organizations: $10 Profit organizations: $25 Supporting members: $50
Membership qualification	Dues-paying individuals	Dues-paying individuals Dues-paying organizations	Dues-paying individuals Dues-paying individuals
Voting stipulations	One vote per member	One vote per individual[2] Two votes per organization	One vote per member
Size of board of directors	15 or less on corporate 10 or more on advisory Unspecified on honorary Board	9 members plus ex officio chairperson of nominating committee	11 members
Board selection	Corporate board elected by members with one person appointed by cable operator Advisory and honorary boards appointed by corporate board	Elected by membership	Elected by membership with one person appointed by cable operator
Terms of office	Corporate: 1 year Advisory and honorary: open-ended terms	Staggered two-year terms	One-year term for officers Staggered for two-year terms for others
Committees named in by-laws	Membership & nominations Personnel & program Finance & fundraising Community outreach, education, & training	Nominating	

Note: Information was gathered from each organization's by-laws, which are distributed by the National Federation of Local Cable Programmers as representative samples of such documents.

[1]Waived for members 12 years and younger.
[2]Persons under 16 years of age and inactive members not allowed to vote.

Exhibit 6-6
General Comparison of Institution-Based Local Cable Program Facilities in Five Cities

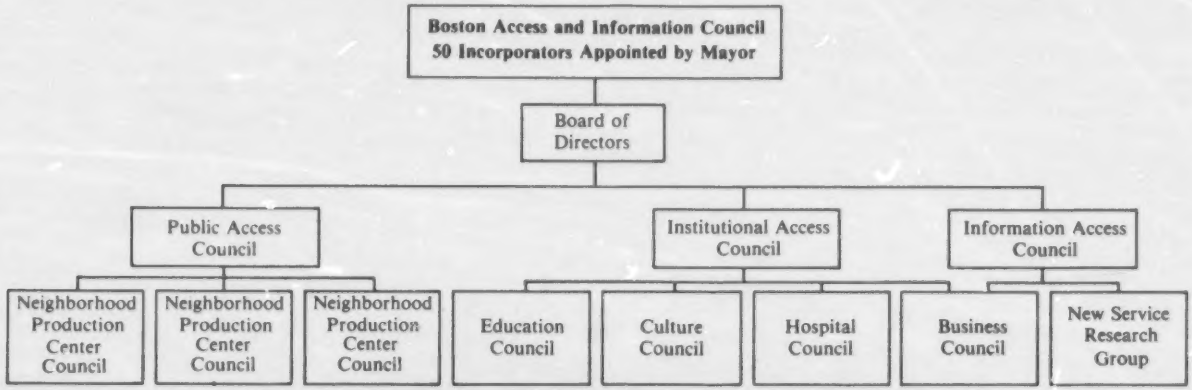
	Bloomington, IN	Iowa City, IA	Iowa City, IA	Knoxville, TN	Madison, WI	Rome, GA
Programming entity	Community Access Ch. 3	Iowa City Public Library	Educational Cable Consortium	St John's Community Video Center	Municipal Video Service	Tri-County Regional Library
Nature of programmer	Joint project: city, library, cable co.[1]	Library	Nonprofit organization	Nonprofit organization	Division of Madison Pub. Library	Library
Channel designation	Leased Community channel[2]	Library access	Educational access	Community/ public access	Municipal access	Library/public access[3]
Location of Facilities	Monroe County Public Library	Iowa City Pub. Library	Junior high school	St. John's Episcopal Church	City-County Building	Library/cable company
1st Cablecast	1974	1980	1980	1975	1975	1974
Hours Cablecasting	68/wk.	60/wk.	8/wk.	50/wk.	32/wk.	30/wk.
Program Focus	Community	Library activities	Schools/ education	Community	City meetings/ culture/issues	Community
Staff: paid	3	4 part-time	None	2½	3	5
interns	3	2[4]		4 to 12	1	1 to 2
work/study	6				6	
volunteers	120-125 yearly	20	Teachers/ students	100-125 yearly		8
Principal funding Sources	Grants Cable company City Library	Library Grants	Member fees Local school board	St. John's Episcopal Church City of Knoxville Grants	Library	Library Small grants
Training/equip. loan	Yes	Loan only[5]	No	Yes	No	No
Other access in city?	No	Yes	Yes	No	Yes	No

[1]Channel in process of forming community-wide consortium, which may become a nonprofit organization.
[2]Leased for $1 per year from cable company by library.
[3]In addition to library-based facilities, cable company studio contains library-owned, broadcast-quality equipment.
[4]Interns work for city but are assigned to library.
[5]Training available from cable company and from city telecommmunications office.

Exhibit 6-7
Comparison of Paid Staff Positions and Responsibilities in Three Institution-Based Program Operations

	Bloomington, Ind.	Knoxville, Tenn.	Iowa City, Iowa
Programmer	Community Access Ch. 3	St. John's Community Video Center (Ch. 20)	Iowa City Public Library
Hours cablecast	68 weekly	50 weekly	60 weekly
Paid staff and duties	1 Director 1 Projects coordinator 1 Operations clerk (scheduling and statistics)	1 Manager (part-time) 3 Operations directors (assist producers, train public in equipment use, cablecast programming) 1 Engineer (part-time/on-call only)	4 part-time staff (library equipment checkout, reservation of public video viewing rooms, other A-V checkout/reservation, cablecast library channel programs)

Exhibit 6-8
Organizational Structure of the Proposed Boston Access and Information Council (Dec. 1980)



additional services include low-cost equipment rental, professional production and postproduction services, captioning for the hearing impaired, cable program distribution, fundraising consultation, facilities design consultation, management services for projects needing nonprofit sponsors, and assistance to community groups and institutions seeking to integrate video use in their day-to-day functions.

The single greatest source of support for independent citizens' access organizations, however, is volunteer effort. Out-of-pocket contributions and time invested by volunteer programmers is often the resource that makes the difference. A case in point is Grassroots Video of Berkeley, California, founded in 1979. On volunteer effort alone, the group has produced programs on oral history, local drama, local government, philosophers and educators, community services, and senior citizen issues. Programs are cablecast on the El Cerrito cable system. As a trade for cleaning up and maintaining the cable system's studio, the group is given channel time and production capability free of charge by the cable operator.

Most organizations hire a full-time coordinator and clerical staff as soon as funds are available. Government or privately funded programs to employ the elderly and to employ or train the disadvantaged are often used to supplement volunteer or paid staff.

One good example of a traditional public access center is the Community Video Center (CVC) in San Diego. Started by students from San Diego State University in 1974, it is now a self-supporting, nonprofit organization. It receives no funds from Cox Cable, the franchise holder. Instead, it finances its operations through nominal fees for classes and equipment rental. Its annual budget is $12,000 and it employs only a bookkeeper. With volunteer support, it runs 40 hours of programming per week. One important activity CVC started, developed, and administered for three years is the PACE program, which teaches senior citizens to make programs for seniors. Italian, Arabic, and Spanish groups make programming with CVC's help for ethnic groups in San Diego. Other productions, in cooperation with local universities and high schools, allow students to make programs within their own schools and cablecast them on the system. CVC also works with local churches, religious groups, and other nonprofit community organizations to program the public access channel. Programs cover financial education, medicine, high school sports, energy, music, books, the Congressional Record, news, and social services. CVC also puts out a monthly newsletter and a monthly program guide, which appears in the local newspaper. Its operating rules prohibit pornography, political advertisements, commercials, and gambling and require programs to meet minimal technical standards.

CVC is not without financial problems. The lack of support from the cable operator and the loss of CETA (Comprehensive Employment and Training Act) funding has reduced the size of the operation. Still, it is one of the longest surviving access groups in the country.

The Anoka County Communications Workshop in Fridley, Minnesota, receives support from the local cable company, Northern Cablevision. It has acquired its own equipment through a yearly telethon and through matching grants from the cable operator. It functions as a facilitating organization for local producers and runs production training classes for community access users. The Workshop cablecasts 30 hours per week of programming. Twenty percent of its programs are live productions, and the company has donated a studio to the Workshop. With an operating budget of $18,000 annually, it employs one full-time coordinator and uses many volunteers.

The Fridley Fire Department produces a show through the Workshop on fire safety and prevention. Also produced are a bluegrass music show, coverage of public hearings, and a live call-in survey of community opinion called "The Fridley Poll." Other programming has included an animated program on solar energy; comedy shows; concerts; auto maintenance; and shows on crime prevention, drunk driving, and cardiopulmonary resuscitation. Specific blocks of time each week allow viewers to request reruns of favorite shows.

Institutionally Based Access Operations

More and more institutions such as schools, libraries, and churches are becoming local cable programmers and serving as equipment access centers. In general, access funding and support have been more stable when associated with a community institution, and access efforts have been more quickly accepted by the community. Not all institutions become involved in local cable programming and access in the same manner. See Exhibit 6-6 for a comparison of the institutional involvement in cable programming in six programming operations.

Institutions as Access Centers

Bloomington, Iowa City, and Rome (exhibit 6-6) all have libraries actively engaged in either producing or allowing their facilities to be used to produce local cable shows. (Madison's municipal programming unit is a division of the library, though the production facilities are not located there.)

The Bloomington and Iowa City libraries believe that making video production facilities available to the public on their premises is as important as providing public access to print, audiovisual materials, and film. The Rome Library does not serve as an equipment access facility; however, like the library-housed video center in Bloomington, it produces and schedules the only local programming being cablecast in the area. Like Bloomington, Rome's channel deals with general community issues, events, and information.

The Knoxville video center, although housed in an Episcopal Church, is an access facility similar to the one in Bloomington. Both the

Bloomington and Knoxville organizations produce programs of a general community nature like the channel in Rome, but they are true public access facilities that train organizations and individuals interested in making local programs for cablecast.

The Iowa City library and Iowa city government, schools, university, and cable company are cooperating so that access programming appears on all dedicated channels in an organized fashion. Schools use equipment at the library, the library receives assistance from city interns, the public receives production training from the cable company or the city, and the company works with citizens who may eventually assume management of cablecasting public access as an independent nonprofit organization.

Madison's municipal access production team, although housed at the City-County Building, is actually a division of the city library. Municipal Video Services does production for the city channel, and the public receives video training and channel time from the Madison Community Access Center, the independent citizens' access organization. (Municipal Video Services is discussed in detail in chapter 7.)

Institutions as Programmers

The degree to which an institution functions as an equipment loan/training facility does not necessarily influence the scope of the program content it generates. For instance, Rome's library is not an access center, yet its channel has a true communitywide focus. By comparison, the Iowa City library, which does function as a lending facility, limits its program content to library-based events, films in the public domain, library service documentaries, and a computerized events calendar.

The generalization can be made, however, that content of a channel is limited in scope when institutions or consortia themselves program a dedicated, or special interest channel. The narrow scope of Iowa City's library channel makes complete sense when public, educational, and government access channels are being programmed simultaneously by these other constituencies; thus, a full complement of programming is made available to subscribers.

In Madison, library-related programming appears on the municipal channel along with shows on cultural events, city meetings, and local issues. City staff feel that the placement of municipal program functions within the library is positive and logical and that relationship can be compatible, providing that the city's regulatory function is kept separate.

Structures for institution-based programming operation fall into two categories: (a) operations that function as a subsidiary of the host institution, and (b) operations that have formed a nonprofit corporation to gain some autonomy from the host institution.

Program operations in the Iowa City, Madison, and Rome libraries are accountable to their public library administrations. Bloomington's operation, though located in the library, is actually a joint project of the

city, library, and cable company and is not accountable to a single institution. However, because of the administrative burden placed on the Bloomington library by the channel's aggressive and successful fundraising efforts, the channel is now in the process of forming a communitywide consortium to which it will be accountable.

With one exception, all these examples are funded primarily by the host institutions. This remains true even in cases where separate nonprofit organizations have been formed to administer the channel.

Except for Bloomington, all other library-based programming projects derive nearly all their funding from library budgets. Bloomington receives only 20 percent of its support from the library; it receives 33 percent from grants, 26 percent from the cable company, and 21 percent from the city. Similarly, Knoxville's operation derives 60 percent of its cash budget plus additional in-kind contributions from St. John's Episcopal Church. The city contributes the remaining 40 percent of the funds. Although small grants provide added income, the Knoxville operation looks forward to receiving support from the cable company. An integrated approach to funding provides (a) insurance against shutdown due to the loss of a single source; (b) financial evidence that all segments of the community support, use, and benefit from the local programming operation.

Day-to-day operations for institution-based program staffs do not differ substantially from operations and management of an independent citizens' access group, if the institution is functioning as an access center for the public. Exhibit 6-7 compares the size and responsibilities of paid staff in Bloomington, Iowa City, and Knoxville, where institutions train the public and/or loan equipment.

Comparing the responsibilities of staff with the number of hours programmed per week illustrates that operations rely heavily on interns and other volunteers. In program operations not involved in training or loaning equipment, the volunteer base is reduced but nonetheless present. At present, the Iowa City educational access channel is being programmed entirely by teachers and students and is coordinated by a volunteer.

Urban Access Management Corporations

Largely as a result of competitive urban franchise awards, the 1980's will see the introduction of yet another kind of organization to coordinate access administration and development—urban access management corporations. Often these corporations are stipulated by city ordinance prior to or in tandem with the franchise process. This style of access management is so new that no operational analysis is yet possible; however, limited generalizations can be made. Urban access corporations are introduced where access support by a company and the franchise fee passes the $1 million mark, where more than one cable company serves a city, and/or where several access facilities are to be built that will require centralized administration.

Urban access management corporations are a large-scale version of the communitywide access consortiums sometimes formed in smaller cities. Sometimes, as in Portland, the public access corporation oversees the public access staff provided by the cable company in their day-to-day functions. In other cities the organization may have no daily production orientation; instead it may be responsible for general policy development for public access channels and administration of public access funds for local producers.

Urban access management organizations incorporate as nonprofit, tax-exempt entities that are separate from the cable company management and the city. To start such an organization, however, the mayor or mayoral appointees often designate representatives of the community to serve as the board.

Exhibit 6-8 shows a proposed organizational structure for access in Boston, suggested in the December 1980 Report of the Mayor's Cable Advisory Committee. The report summarizes the responsibilities of the proposed Boston Information and Access Council as follows:

- Carry out preliminary and ongoing public education and needs assessment functions;
- Allocate channel space, facilities, and resources;
- Facilitate new communications programs and uses among and between constituent groups;
- Develop and budget funding sources and revenues.

This example does not include management of any production staff.

Advocates of these structures recommend that funding be made permanent by allocating a portion of the city-collected franchise fee to the organization. Additionally, the cable companies generally pledge generous financial support to the citywide management corporations. The Portland Cable Access Corporation (PCAC), for instance, must negotiate with the city of Portland to continue its service contract. The city's franchise stipulates that 2 percent of the collected franchise fee is to be allocated to public access. However, PCAC's request must be approved annually as a line item in the city budget.

The internal management structure of the urban access management corporations can vary, depending on the scope of responsibilities. For instance, if an organization is limited to disbursing funds and setting policy, a small, administrative staff is sufficient for coordinating the many appointed and volunteer councils and work groups involved in drafting policies, giving advice on funding strategies for projects, and performing other nonproduction tasks.

If an organization is involved in production as well as management of access facilities, its staff would have to be larger. Responsible to the Portland Cable Access Corporation, for instance, are three public access coordinators and one access technician, who manage operations of various access facilities throughout the city.

Audio-Only Access: Cable Radio

Cable radio can serve as a local programming medium as well as a regional or national one. Cable systems have the capacity to carry 50 audio as well as video channels. At present, most cable systems offer some form of cable radio service, usually the rebroadcasting of local FM radio signals. In addition, many carry stereo simulcasts of movies, shortwave services, 24-weather channels, and religious services.

Much like the community programming "movement," community radio broadcasters have been programming small listener-supported radio stations for many years. According to the National Federation of Community Broadcasters, approximately 30 member community radio stations were simulcast on local cable systems in 1982, mostly over automated video channels. The Intercollegiate Broadcast Society (IBS) estimates that 50 college stations are simulcast on cable. These stations have varied formats that, like local origination and access groups, attempt to reflect the diverse composition of their communities. One such station, WORT-Milwaukee, became involved in its local cable television franchise process. Under an umbrella name, Milwaukee Community Radio, the group issued position papers on suitable radio equipment, channels, and support to help the city develop its request for proposals for cable television. When several companies submitted bids, the groups analyzed the audio provisions and issued a report to the city. As a result of this group's activity, all bids for the franchise had above-average radio proposals. This is one example of how existing media groups can improve cable's community services.

The University of Kansas Audio Reader Network serves fifteen communities in the Lawrence, Kansas, area via microwave. The main fare is local news and in-depth stories (analyses and editorials) that are not available on radio, as well as advertisements of local sales and so on. Best-seller books can also be read over audio services; such reading is immune from copyright liability so long as it is not done for "commercial advantage." The Audio Reader produces approximately 70 hours of programming per week, with three full-time staff members and help from several volunteer readers.

National Public Radio (NPR) recently began testing the waters for a national cable radio service that would draw partially on its Services for the Print Handicapped program, in existence since 1979. The service provides thirteen hours of readings per week from the *New York Times*, the *Wall Street Journal* and other publications and is carried on the subcarrier of any station that carries NPR programming. This service can be decoded by cable systems and carried on a vacant audio channel.

As of early 1982, there were no cable audio access channels in use, although many are planned. However, there are several cable-only radio stations that lease channel space from the cable system. These may provide a prototype for cable radio access channels, both in management and in programming formats.

WRKB in Knoxville, Tennessee, is the best-known and best organized of these. The station is one project of several undertaken by the Knoxville Communications Collective, which also runs a television studio, a recording studio and a theatre. The station is minority-run and receives grants from the Booker T. Washington Foundation and other groups. It also is supported by listener donations. It is housed at the University of Knoxville, which provides work-study students, interns, and some volunteers. Only the station manager is employed full time; the station relies almost entirely on volunteer support. WRKB has been in existence for six years.

Because radio equipment is portable, inexpensive, easy to operate, and nonvisual, cable radio access holds much promise as a local communications medium. A simple radio station can be outfitted for as little as $8,000, although constant use and the need for postproduction facilities can push the price much higher. Minimal equipment needs for a cable radio operation include the following:

- 2 turntables
- 2 cart machines
- 2 reel-to-reel tape recorders
- 1 cassette tape recorder
- 2 monitor speakers
- 4 microphones
- 1 audio mixer
- 1 mixing control board
- 4 sets of headphones
- various amplifiers and cables
- mic stands, tape, etc.

In addition, certain equipment is required to feed the audio signal onto the cable system. If the audio facility is not located at the cable system, a dedicated return cable frequency or phone line may be used to transmit the signal to the cable headend. The total cost of audio transmission equipment (minus production equipment) is around $5,000. Thus, a cable radio facility can be set up for as little as $13,000 to $15,000, significantly less than needed to outfit a video production studio.

Although radio is often perceived as a less "glamorous" medium than video, it has certain advantages for community use. Audio production equipment is inexpensive, portable, and easily understood and operated. Most people already know how to operate a tape recorder and speak into a microphone. Editing is much easier on audio-only equipment, because editing equipment consists of nothing more than two tape recorders, or one tape recorder and a razor blade and tape. Audio signals can be sent to the cable system from any remote location that has a phone line, so that live remote programming is easy to initiate. No lights, camera presence, or steady arms are necessary to create an acceptable radio program. Thus, the medium is unobtrusive and far less intimidating than video program production.

Summary

Community programming on cable has evolved in the past decade from a relatively simple idea to an important cable service available on hun-

dreds of systems throughout the country. Access and local origination can take many organizational forms, although the intent is almost universally to provide an outlet of expression for community groups and individuals over the cable system. Cable is uniquely suited to achieve this intent because of its multiplicity of available channels and its uniquely local nature.

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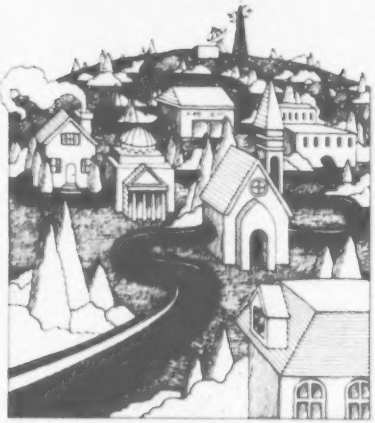

Local Government Uses Of Cable Television

*By**
John Velie

*The editors gratefully acknowledge the contribution of Merry Sue Smoller to the case study on the Municipal Video Service in Madison, Wisconsin.

Chapter 7: Local Government Uses of Cable Television

During the past ten years, many cities have included specific provisions relating to municipal use of the cable system in their cable television franchise ordinances. These provisions often require that a channel or channels be dedicated to municipal use on the subscriber trunk and on the institutional trunk. The ordinance may also require equipment or some form of access by the municipality to cable operator-supplied television production hardware, studio space, and television production training.

Inherent in these provisions is the right of the municipality to make use of the aforementioned channels, equipment, and training whenever it desires. In most instances, use has been minimal, however. One reason is that most local governments, while recognizing the potential of cable television, have neither the staff, budget, or time necessary to develop specific applications. A second reason is the lack of models.

This chapter describes uses of cable in five cities. These case studies are followed by a discussion of three municipal applications of cable—as a way to deliver public information, to expedite and improve city services, and to improve intercity and intracity communications.

Case Studies

Overland Park, Kansas

The city of Overland Park, a suburb of Kansas City, Missouri, with a population of 80,000, has been using cable technology in its traffic control operation, known as the Overland Park Traffic Control System (OPTCS).

The $1.2 million system coordinates traffic flow at 50 to 70 intersections throughout the city. Sensors buried in the streets near these intersections record data on traffic movement. The data are sent via a leased cable channel to the cable system headend, where they are routed via cable to a computer in city hall. The computer, programmed with software developed by the Federal Government, analyzes the data and sends command signals via the cable system back to microprocessors near the intersection. These microprocessors then instruct the nearby traffic lights to signal red, yellow, or green.

The system was constructed using a combination of Federal (70 percent) and local (30 percent) funds. It was built in response to the traffic congestion problem facing many burgeoning suburbs. The OPTCS system required four months for initial debugging, primarily because it was a prototype system. The system currently works efficiently with almost no down time. It requires 1.5 employees plus approximately $26,000 a year to maintain.

Cable was chosen as the distribution link for two reasons. First, the two-way capability of cable and its extremely high data transmission rate, approximately 100 times that of telephone lines, made it a technologically superior choice. Second, Overland Park was being wired for cable at the

same time the OPTCS system was being developed, and OPTCS hardware could be piggy-backed onto the cable system construction.

The OPTCS system has resulted in a number of direct benefits. According to an evaluation conducted by the city,

> . . . motorists experienced eight percent less delay, eight percent less total travel time and 24 percent fewer stops since the installation of OPTCS. These improvements in traffic flow result in a direct savings of $500,000 per year to motorists in Overland Park in fuel alone, based on an annual reduction of 400,000 gallons at $1.25 per gallon, or 20,000 barrels of crude oil . . . automobile emission reduced annually will include 428 fewer tons of carbon monoxide, 28 fewer tons of hydrocarbons and 24 fewer tons of nitrous oxide . . . [plus] 283 fewer hours of travel time during a.m. and p.m. peak hours.[1]

Brea, California

Brea is a city of 25,000 population, located 30 miles southeast of Los Angeles. Cable television technology is an integral part of the city's plan to maintain a small-town atmosphere while aggressively seeking development for the area, which is expected to reach 80,000 population by the year 2000.

In 1978, the city formed the Brea Telecommunications Division (BTD) to support the city's long-term goals. The BTD has several responsibilities—to maintain close citizen-city communication by cablecasting city hearings, school board meetings, etc.; to foster a sense of community history and unity by cablecasting programming about the city's people and history; to improve city services by standardizing training for city employees through the production of training videotapes; and to aid in the city's economic development efforts.

In the field of economic development, the BTD, working in conjunction with the planning department, creates video tapes about areas the city wishes to develop. These tapes are shown to prospective developers, used as visual aids at public hearings, and/or cablecast over the city's dedicated municipal access channel.

The video hardware the BTD uses in its economic development efforts is the same hardware used in its cablecasting efforts. In 1980, Brea built a civic/cultural center that is completely equipped for television production. The building, financed through the sale of lease revenue bonds, has a TV studio, a 200-seat theater, executive conference rooms (designed for teleconferencing), art gallery space, and a 306-seat community meeting room, all of which are rented out to the private sector to generate operating revenue.

The BTD operates on a $90,000 a year budget, covered in part by the city's 5 percent cable franchise fee, with four full-time employees. In addition, student interns from California State University at Fullerton are used as production staff.

[1]Executive Summary, *Overland Park Traffic Control System* (Overland Park, Kans., September 1980).

Cable technology's usefulness in meeting Brea's informational goals is described by Wayne Wedin, the city manager:

> There are many who talk about cable television as bringing about an era of electronic democracy—while the Brea experience has not yet been carried that far, it has provided another valuable mechanism to support meaningful communications with the citizens of the area and to provide increased information concerning the actions of government. With the average U.S. citizen watching approximately six hours of television per day, the use of this technology for informational and training purposes by the city of Brea is certainly a use of state-of-the-art communications capability that people are used to watching."[2]

Reading, Pennsylvania[3]

In Reading, the city does not administer or control municipal cable usage. Cable services for the city are provided by a separate, independent, nonprofit organization, Berks Community Television (BCTV).

BCTV operates an interactive (teleconferencing) network involving up to five geographically separate origination points. These locations can vary because portable origination equipment is used. Each origination point can send and receive video and audio signals to and from every other location. The dialog that takes place between these origination points can also be seen over the public access channel on the subscriber trunk.

Since 1977, Reading has conducted all of its budget and community development hearings over this interactive network. City council members and citizens gather at any of the five origination points to hear and voice their concerns. Cable subscribers can watch the proceedings at home and call in their comments by telephone. Noncable subscribers can participate in person at any of the origination points, not just city hall.

According to former BCTV director, Jerry Richter, the city began to use the interactive system out of frustration over the lack of citizen participation at public hearings. As many as 50 residents now actively participate compared with the previous average of two citizens at city hall meetings. This figure does not include citizens who view the hearings from their living rooms.

Concerning the city's response to using the interactive system, Richter quotes Mayor Karen A. Miller: "The city has come to depend on it . . . if we wanted to be irresponsible public officials we could go back to the old way, being satisfied with one person showing up for a public hearing."

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[2]Wayne Wedin, "The Essential Element," *Public Management*, International City Management Association, June 1980.

[3]Material for this case study was gathered from Jerry Richter, "Berks Community TV's Interactive Ability is Integral Part of Reading City Government," *Community Television Review*, July 1981.

Clinton Township, Michigan

This jurisdiction in eastern Michigan is testing the efficacy of cable television hardware for monitoring water meters. Many of the city's residential water meters are located inside the home, making access to the meters by city personnel difficult. In addition, as the cost of water goes up, the city receives numerous requests from users for more frequent billings, since many people prefer small monthly bills to large, accumulated bills.

Working in cooperation with the local cable company, an electronics manufacturer, and two water meter equipment companies, the city is finishing preparations for a test involving 50 water meters in a one-square-mile area. The system being tested works as follows. Each water register is hardwired to a microprocessor hanging next to it on the wall. The microprocessor, which is wired into the cable television line coming into the home, collects and stores data on the home's water use. A computer at the cable company's headend receives this information over a return channel on the subscriber trunk. The data are sent to the city, either by phone line or cable line, where they can be displayed on a CRT screen or printed out. Using the system, the city can call up data on any wired water meter at any time.

The city's water management department expects the system to benefit city residents in a number of ways. First, it will eliminate the need for city meter readers to enter private residences that subscribe to cable. Second, labor costs will be reduced because fewer personnel are required. Third, the instant data recall feature of the system makes monthly billings a possibility. The city hopes, if the test is successful, to work out a long-term, fixed-price leasing arrangement with the cable operator for its use of the system. The test results of Clinton Township's cable television delivered water meter monitoring system should be available in the fall of 1982.

Madison, Wisconsin

The longevity of Madison's municipally financed video operation makes its experience with cable especially interesting. The city established a cable television office in 1974 to regulate the cable system and to operate and produce programming for the government access channel. In 1980, the office was reorganized, with its regulatory function transferred to the city's department of administration. All programming responsibilities were shifted to the Madison Public Library, and the Municipal Video Services (MVS) agency was created.

Currently operating on a $70,000 a year budget (from the city's general fund), the staff of three full-time employees and five students hired through the University of Wisconsin program this dedicated municipal access channel 24 hours a day. The programming consists of 130 hours a month of live and taped video segments featuring cablecasts of city council meetings, a daily employment information series, election coverage, inter-

views with city and State officials, training tapes, and profiles of city services. The remainder of each programming day consists of character-generated print information concerning city services and upcoming events.

The success of Madison's local government programming lies in the gradual development of the service over the years in a planned, structured way. For example, programming on the city channel began in 1974 in black and white with a staff of one and a borrowed portable camera and videotape recorder. The early purchase of a character generator provided the ability to establish the municipal access channel as a full-time source of information. The amount of nonprint, live, and videotaped programming could then be gradually increased as staff and budget permitted. Through this careful, staged approach, the city's production capability has expanded, not only in quantity of informational programming provided to citizens, but also in quality, as currently evidenced by MVS's sophisticated full-color productions.

In 1981, MVS was faced with being eliminated from the city budget altogether. However, a poll conducted for the city as part of its five-year cable franchise review revealed that approximately two-thirds of those surveyed favored continued city funding of the MVS. The survey results plus letters of support from other city agencies performed a useful public information function. MVS was funded again and today is one of the oldest municipal video operations in the country.

Municipal Cable Use Options

Any municipality wired for cable has at its fingertips an extremely flexible communications matrix capable of transmitting images, sounds, and data. New methods of using cable technology to improve and expand city services are constantly being developed. The following list of cable use options describes several categories of municipal applications.

Delivery of Public Information

Currently, most cities deliver information to their citizenry in three ways: through public hearings, through local media news coverage (i.e., local newspaper, radio, or broadcast TV), and through occasional mailings. Each method can be successful, but each method also has drawbacks.

As city officials are all too aware, attendance at public hearings is often sparse. Citizen participation seems to rise during discussions of potentially emotional subjects (such as discussions on firehouse closings), but attendance is usually low at city meetings where day-to-day municipal problems are discussed. Using the local media to convey municipal concerns is often less than effective, since there is no way to control either the timing or the content of the message. Mailing out information is cumbersome, and the frequent rises in postal rates make this method costly. In short, a problem facing most local governments is finding a cost-effective and reliable way to reach the public.

Some local governments have turned to cable television to help meet this need. Municipalities can become active cable television programmers. The cable franchise ordinance can be written to guarantee a dedicated municipal use channel. Equipment and staff can be funded by the cable franchise fee. With these elements in place, a local government can deliver the following types of information over the cable subscriber network.

City hearings, council meetings, etc. As is the case in Madison, city meetings can be cablecast live and videotaped for a repeat showing later in the week, allowing a greater audience and helping local governments meet State and Federal guidelines for holding public meetings. Continuous and full coverage not only provides a major service to citizens unable to attend meetings, but it also may help to improve the accuracy of other media reporting the event. Home viewers can quickly judge the fairness of the way public meetings are being reported.

Using low-intensity lighting, remote controls on fixed cameras, and other special equipment, public meetings can be cablecast in a way that is nonobtrusive to the proceedings.

Emergency information. In many cable systems, local public officials can override regular programming to deliver vital messages.

Announcement of city events and services. A constant stream of "print" information concerning city services and events can be programmed up to 24 hours a day using a character generator.

Profiles of city services. Minidocumentaries, call-in programs, and talk shows are some of the formats municipal cable programmers can use to inform the citizenry about city service availability.

Interactive community discussions. As described in the Reading case study, two-way video discussions between citizens and community leaders originating from various locations throughout a municipality can be cablecast over the municipal access channel to the entire community.

Institutional Network Applications

Municipal governments, city agencies, and public school systems can use the institutional network of cable systems to improve services and achieve cost savings. Services available include the following:

- Video interchange; for example, exchange of courses and teachers within a school system by video interconnect.
- Teleconferencing, for meetings and conferences.

A complete discussion of the institutional network and of municipal applications appears in chapter 5.

Cable can be used to enhance the operation of many city services by combining the two-way (interactive) capabilities of cable with computer technology. In all of these applications, the general operating principle is the same—microprocessors at remote locations gather and store data, which are transmitted over the cable system to a computer located in the cable system headend. Once the information reaches the computer, deci-

sions affecting one kind of service or another can be made. The ability to gather and transmit information virtually instantaneously provides cost savings to the municipalities involved.

Monitor public utilities. Street lights, traffic lights, water meters, sewage treatment facilities, electric meters, and almost any fixed facility that must be monitored or coordinated in any fashion can be hardwired into the cable television matrix. Information regarding any of these activities can then be gathered, stored, and used for a variety of purposes.

Today, the primary difficulty faced by municipalities trying to incorporate remote monitoring systems is not a hardware problem—cable/computer designs are flexible enough to handle virtually any application—but a software problem. The computer programs necessary to operate many of these systems need to be developed and then tailored to the needs of individual communities. Since Federal monies for researching and developing this software are now virtually nonexistent, it is hoped that the cable industry and its associated manufacturers will meet the demand.

Improve both intra- and intergovernmental communication. In this application, cable technology is used to improve the communication flow both within the departments of local government and between different levels of government (such as city to county or city to State).

Standardized training videotapes can be produced by the municipality or in cooperation with other entities (such as a local school system or the cable operator's local origination staff) on a variety of subject areas such as firefighting, first aid, and civil defense. These training tapes can then be played back over the cable system. Standardized training tapes can help cities avoid the costs of duplicating classroom demonstrations and lectures.

In a classic example of firefighter training, the Madison Municipal Video Services (MVS) agency produced a videotape about one aspect of fire prevention techniques. At the request of the fire department, MVS cablecasts the program during various times of the day to reach each shift of firefighters. Because the various firehouses are wired for cable, firefighters can view the tapes at their own stations instead of traveling to the main firehouse or city hall.

Travel time and cost can be reduced by using the interactive video capabilities of cable. Meetings between municipal employees located in different geographical locations can be conducted via video and cable (see the Reading case study). Automated teleconferencing hardware (voice-activated cameras and microphones) is available on the market, making this technology accessible to municipal employees unfamiliar with electronics hardware.

Administrative data transfer. Payroll, budget, and other administrative data can be transferred from one city location to another using the cable/computer interface. Many cities use dedicated telephone lines for data transfer, at substantial cost. Cable can provide an alternative distribution means, often at substantial savings. New York City is experimenting

with this approach. Eighteen data lines (approximately three full video channels) are being leased from the local cable operator. These lines, covering a distance of two miles, carry two-way data from the city's computer services center to the department of finance. Previously, this information was transmitted over telephone lines; however, cable is being substituted because of its faster transmission rates and lower costs. As the costs of local telephone service increase, New York is preparing to substitute cable lines for telephone lines wherever practical.

Regional interconnection. Local governments can be connected for data (and video) transfers to county and State offices in areas where cable systems are interconnected. Interconnection is usually a combination of microwave and cable transmission that allows a signal to originate at a municipal office and travel via the cable system interconnect channel to the cable system headend. The signal is then microwaved over a chain of microwave relay stations until it reaches the appropriate cable system location (perhaps that of a State or county office), enters the cable system via the headend microwave tower, and is sent along the cable interconnect channel to the appropriate destination point. Interconnection between cable systems is a reality in Connecticut and is underway in New Jersey. (See chapter 11 for more details about interconnection.)

Summary

Potential municipal uses of cable technology are limited in any given area by the channel capacity of the local cable system. A local government may desire to use the cable system for one or more of the applications described. However, if the cable system does not have the channel capacity necessary for these applications, that is, if all of the channels on the system are already being used, the desire for municipal use becomes a moot point.

Municipal applications that directly affect citizens—such as delivery of public information and home security systems—must by necessity be carried over the subscriber trunk. All other municipal applications can be carried over the institutional trunk. In either case, a municipality can help protect its channel capacity requirements by requiring dedicated channel space on both the subscriber and the institutional trunks in its franchise ordinance provisions.

Ten years ago, the authors of Cable Television Information Center's first handbook on local government uses wrote the following:

> In order to function well—in some instances, to even function at all—government must communicate with the citizenry. This is particularly true in a democratic society, where government functions with the consent of the governed. Of all levels of government in our system, it is most essential for local governments to communicate with their constituencies since that is the level closest to the changing moods of the electorate.

Surely, these words remain true today.

Governments must communicate with the citizenry and cable television can provide a useful means of achieving that end. This chapter, however, has outlined ways that cable television can be used to enhance municipal functions beyond simply delivering public information.

Local governments today face a seemingly unsolvable dilemma—the costs of maintaining city services are increasing while the availability of State and Federal funds to help cover those costs is decreasing. Local governments must become more efficient providers of services. Through careful planning and close cooperation with the local cable operator, municipal officials should find cable television to be a positive tool to help resolve their problems.

8

Educational Uses Of Cable

By

Carol Brown Eilber

Chapter 8: Educational Uses of Cable

Education faces numerous problems in our changing society. At the primary and secondary levels, schools are experiencing declining enrollments, budget cuts, and escalating costs. Despite increased demand for lifelong learning, institutions of higher education face the rapid obsolescence of acquired knowledge in many disciplines, growing requirements for recertification, and the inability of many prospective students to attend classroom courses.

These problems have contributed to increased interest among educators in the use of telecommunications to bring credit and noncredit offerings to students in remote locations. Educational uses of telecommunications undoubtedly will increase during the 1980's and cable will be one of the major technologies employed. The entire field of telecommunications is an active frontier in U.S. education.

In communities that have recently franchised for cable, educators have often become involved in the process. Some of the steps educators have taken include the following:

- Becoming familiar with the cable franchising process and the various rules and regulations that affect that process.
- Conducting public education efforts. Groups will be more likely to support educational cable provisions if they are aware of the services cable can offer.
- Studying the policy decisions involved in organizing and implementing educational cable service.
- Determining services and facilities educators need and reporting them to the local franchising authority.
- Establishing a realistic plan for funding and supporting educational cable service.
- Monitoring franchise negotiations.
- Establishing a governing body and permanent procedures for administering educational cable services.[1]

Among the types of assistance to schools and educational institutions that municipalities have requested in RFP's or cable companies have offered are the following:

- A free cable drop, on both the subscriber and the institutional networks, for all public school buildings. Normally, such free drops would not include free access to premium services (pay TV).
- Provision of a pool of converters and modems that can be made available for all public institutional users, including public schools and other institutions of education, without charge.
- Provision of one or more channels on the institutional and subscriber networks for educational uses.

[1]Phillip Miller, "Securing Educational Cable Service" (Cambridge, Mass.: Massachusetts Educational Television), 1981, pp. 1-2.

- Assistance in wiring school facilities for broadband communications. In some franchise bids, cable companies have offered to provide such wiring at cost.
- Funding for studio, equipment, and production facilities for program origination by the school system. In RFP's, this is usually listed as a bid item rather than a requirement.

A Consortium Approach

In the Fort Worth area, the countywide Council for Educational Television in Tarrant (CETT) was formed in 1979. This consortium includes representatives from hospitals, museums, school districts, parochial schools, regional educational centers, a large seminary, a junior college with three locations in Tarrant County, a regional library association, a university, a college, and a zoological park.

CETT's purposes are to seek access to cable for the educational community; provide coordination in use of these channels, provide arbitration upon request for user disputes, and encourage growth and innovation in appropriate utilization of cable channels on all systems within the designated area.

The consortium devised a plan for securing educational access to cable in a "Statement of Policy on Educational Access to Cable Television Channels." In it, city councils were asked to provide "channel capacity for existing, proven uses of instructional television." In Fort Worth, seven channels were provided for education and community access. CETT recommended seven channels after careful study of both current educational activities and future needs. The following diagram[2] shows the way CETT planned to allocate the seven channels, including one for community access:

Channel		Midnight to 7 a.m.	7 a.m. to 4 p.m.	4 p.m. to Midnight
1	—	(Block A)	(Block B)	(Block C)
2	—	All users	Elementary and secondary	Colleges and universities
3	—		schools (public and	
4	—		private)	
5	—	(Block D)	Community/junior college district	
6	—	(Block E)	Professional continuing education	
7	—	(Block F)	Community access	

[2]"A Statement of Policy on Educational Access to Cable Television Channels" (Fort Worth, Tex.: Council for Educational Television in Tarrant, 1979), p. 2.

The CETT plan establishes a priority system for each time block to permit use of channels by others, including the cable operator, when the designated group is not programming. Other provisions requested by CETT concern cable drop points, interconnections with originating sites, assurance of maintenance and upkeep, and assurance of space on the basic tier. In its "Statement of Policy," CETT also outlined staffing and funding options.

CETT's unified approach to planning for educational access, and its visibility during the franchising process, played an important role in the development of educational provisions in Fort Worth's franchise adopted in 1981. The franchise provides for ten access channels, with six on the basic tier designated for education. Educators will also share in the institutional network. Switching allows programs on this network to be carried on the consumer network, if desired.

In addition, the cable company will make a $100,000 one-time-only grant the first year to be used to improve educational teleproduction facilities. Institutions will receive one free drop at the location of their choice as well as access to all of the company's equipment. The company will provide two vans equipped for production of access programs and three access TV studios. The four cable systems in the county have committed to interconnect to give countywide coverage to educational programming.

After the franchise was awarded, CETT began efforts to assure use of the channels. The organization sponsored a workshop on educational use of cable that attracted 200 representatives of its member organizations. The consortium also has asked to be assigned the function of coordinating the educational access channels. Decisions on this matter and on allocation of channel space will be made by the newly appointed citizens' cable board.

Educational Access Implementation

When the franchising process is over, educators are faced with the reality of using the cable effectively. Many schools that currently use cable have found that it can provide needed flexibility in serving institutional and community needs.

By wiring school facilities internally and interfacing these internal wiring systems with the cable system, educators can distribute instructional programs from a central location to schools throughout the district without having to move equipment and personnel. Different programs can be shown to several classrooms and viewing locations simultaneously, and teachers can specify the most convenient time for a group to view a tape. Channels can also carry student-produced, in-service training, and films for preview by teachers.

Using channels on the subscriber network, schools can reach out to the community to show activities and teach courses. School board meetings, sports, plays, and concerts can be cablecast. Citizens can be informed about bond issues and other matters of importance. Educational materials can be

transmitted to sectors of the community that are difficult to reach, such as handicapped people and parents at home. Programs can be repeated at different times to reach the maximum number of people and to allow students enrolled in telecourses to "attend classes" at their convenience. Schools can work with groups in the community to produce shows to fill needs unmet by other local media.

Teachers can use cable to prepare for adjustments in their roles, as more students move to telecourses and other forms of electronic learning. A start can also be made at addressing issues associated with teleteaching, such as the use of videotaped courses. Some teachers are concerned, for example, that a time will come when they will continue to teach their classes electronically while they actually are outside on the picket line. Others feel that they should receive more pay when their courses are distributed via cable television to a wider audience and, therefore, to more students.

Integrated Approaches to Educational Cable

Spokane, Washington

The Spokane public schools have used instructional television since 1967 through public television channel KSPS, which is owned and operated by the schools. In 1973, a consortium of educational organizations sought and received a supervisory role over five cable channels provided by the franchise agreement for the 35-channel Spokane cable system. The consortium, still active today, consists of 14 education-providing local and regional institutions.

The school board provided $100,000 for a headend located at KSPS to distribute educational programming to member organizations and the community. In addition to the five channels, the cable company provided drops to all schools and converters to selected sites, and worked with the schools to provide a clean, consistent signal. By September 1977, all five educational channels were operational, aided by substantial grants from the U.S. Department of Health, Education, and Welfare (HEW) and the Corporation for Public Broadcasting.

The K-12 schools have been the main users during school hours, with other groups in the consortium programming mostly after 3:30 p.m. In 1981, the consortium began to experiment with one channel of higher education programming in the daytime. During the first years that the Spokane schools used cable, KSPS continued to distribute elementary school programming. Now, most of the school programs are carried on cable, and KSPS carries predominantly community and public TV fare.

The school cable TV operations are in the same building as KSPS, which makes sharing of studios possible. Gonzaga University, for example, leases the KSPS facilities to produce its own shows. Because the station is owned by the school district, students may operate the cameras.

At the schools' cable center, use of a Hewlett-Packard 250 computer, purchased with HEW funds, allows a single operator to coordinate

all five channels. The computer signals the operator to load tapes and keeps track of tape usage so that effectiveness of each can be weighed in terms of costs. It also operates seven character generators of announcements.

Today, all classrooms and other strategic locations such as libraries and principals' offices in the district have color TV monitors. A total of 1,500 25-inch sets are serviced by two full-time maintenance employees. Capital expenses such as the TV sets are part of the regular school budget.

Besides the computer programmer and the two maintenance people, there are five full-time employees and one part-time employee on staff for KSPS and the cable operation. This includes the director of telecommunications, a secretary, two engineers, the chief of broadcast programming, and a part-time person to maintain the station equipment. In addition, part-time TV coordinators at the schools help teachers.

Operating costs for the system amount to nearly $120,000 a year. The public schools provide $60,000, KSPS underwrites $30,000, and other members of the consortium pay the remaining $30,000. The school district spends $330,000 a year for its entire television operation. The other consortium members pay annual fees based on school size and number of operating hours on cable.

Most of the time, the cable channels are filled with taped programs requested by teachers from a catalog of 1,200 titles. The K-12 schools do little cable production, although a few programs such as a recent one on Veterans' Day are produced by students. Programs produced within schools can be distributed on the schools' internal system, which has 11 channels, or to the consortium and community via the headend at the KSPS location. Occasionally, cable is used to assemble the entire faculty such as at the opening of the school year. Also, special systemwide in-service sessions have been held on cable four times yearly.

The five educational channels are filled day and night. Besides the programming by the public schools, other consortium members offer telecourses and continuing education programs. Two hours a night Gonzaga University uses cable as an outlet for college senior productions on public affairs. There are two production teams in the senior course; the programs they produce are repeated to fill out the schedule.

The newest development in Spokane's educational cable operation is installation of two-way hook-ups to seven consortium locations. This service will be used primarily to feed programs in both directions, not for interactive classroom use, although two of the higher education members do have plans to use their links interactively.

Trempealeau County, Wisconsin

Another illustration of an integrated approach to educational uses of cable is provided by Wisconsin's Trempealeau County. In 1973, the Western Wisconsin Communications Cooperative (WWCC) was formed to bring broadband interactive services to rural Trempealeau County. The

county has 25,000 residents, eleven incorporated communities, and eight K-12 school districts.

The idea for the cooperative began when educators in the county realized that interactive, audio/video cable television connecting all school districts might serve some of their needs. They envisioned holding interactive classes among schools. In this way, they could eliminate the need to bus students and teachers back and forth throughout the county, as they had been doing to expand the vocational education curriculum. The money used for busing could instead be used to expand educational opportunities using cable.

The schools' representatives, as members of the cooperative, worked toward meeting the conditions for securing a Farmers Home Administration loan to own and build the cable system—including such difficult challenges as working to change a Wisconsin statute to allow Wisconsin school districts to enter into long-term lease agreements. With this stipulation met, in 1975 school administrators formally adopted a 15-year lease agreement with the cooperative.

During the planning stage, the cooperative won a planning and development grant of $510,170 from the W.K. Kellogg Foundation, including funds for equipment to enable each school district to originate programming on the system. The grant also provided money for training of school personnel under the direction of the four universities in the West Central Wisconsin Consortium. During this phase, all eight school districts participated in demonstrations to use the system for administrative, instructional, and student activity purposes.

In November 1978, all of the conditions of the Farmers Home Administration were met and the loan was approved. Under a 15-year agreement with the cooperative, the schools have exclusive use of their channels, for which they pay a yearly fee to the cooperative. Subscriber service on the system began in July 1979, and the first two-way TV transmission between two schools in the county began that December. Today, the schools use the two-way audio/video system to interconnect schools to teach interactive classes in computer science and French. Freshman history is team-taught on the system, and there are courses in music appreciation and math.

School officials expect that the system will provide greater opportunities for in-service training among school districts, including training for support personnel such as bus drivers, cooks, teacher aides, and clerical staff. Since the cooperative plans eventually to make the system available to every residence in the county, the schools will have opportunities to reach the homebound, including the severely handicapped. Already, the cooperative provides 3½ hours a day of programming for senior citizens, who sometimes help with television production. All nutrition centers in the county—where seniors gather for noon meals—have cable drops, monitors, and phones for calling in to the TV studio.

Officials of the cooperative view education broadly:

> We must recognize that the ultimate education forces are not the schools and colleges, but they are our work, our communities, our families and our media. . . . The communication technology provides the learning opportunities to be extended to literally everyone in the county, at every age and basically, in every circumstance of life, and the challenge of the project will be to meet those individual needs.[3]

School Uses of Cable for Community Outreach

Many K-12 schools use cable TV to inform the public of school activities. In this way, cable becomes a medium for accountability of public funds. It also involves students in the television process.

In East Hampton, New York, the educational access channel carries athletic contests, plays, concerts, and news shows to the public. School personnel are particularly interested in reaching persons such as the elderly who seldom go to school activities. The schools have launched programming for and by the elderly, both to meet some of their needs and to involve them in the schools' television activities.

Other monthly shows involve the community, such as "Town Hall Report" and "BBS Talks to. . . ," which are hosted by students who interview guests from the community. The schools also report local election results on election nights. As part of this coverage, a computer program written by students tabulates results, which are transmitted to home viewers' screens.

In Fredericksburg, Virginia, the schools cablecast a one-hour locally produced show twice daily, seven days a week—an impressive activity for a school district of 2,200 students. New shows appear on Monday, Wednesday, and Friday, with repeats on other days. These programs include "Here and Now," a monthly half-hour visit with the Mayor of Fredericksburg; "Community Corner," a weekly program featuring officials from local community service organizations; "Caring for Kids," a series with professionals who discuss learning problems; and other programs ranging from school news and sports to community topics. Students assist with the productions by shooting footage for in-depth reports, and they serve as technicians or crew in larger productions such as the "City Council Forum," sponsored by the League of Women Voters.[4]

One feature of the system is automatic playback equipment, which runs taped programs without assistance from an attendant. This permits tapes to be played regularly during weekends and holiday breaks. The school/community programming in Fredericksburg is a product of a three-year pilot program funded by $8,000 from Virginia's Department of Education and matched by the Fredericksburg School Board. According to Joe

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[3]"Trempealeau County Kellogg Project: A Rural Telecommunications Service System" (Trempealeau County, Wisc.: Western Wisconsin Communications Cooperative, 1980).

[4]Joe Wirtala, "How One School System Programs the Local Cable," *Educational & Industrial Television*, May 1981, p. 103.

Wirtala, supervisor of public information, to convince the board to participate in the project:

> We spent three months making a solid production effort (with a lot of patchwork technical systems and other shoestring efforts) so the Board members could watch in their homes and see what the possibilities were. The next time the approval of the Channel E pilot study was up for a vote, the Board decided unanimously in favor of the project.

The cable operator helped to wire the school buildings and city hall in Fredericksburg. The schools bought a single-channel microwave system to transmit programs four miles to the cable headend. The remote production system, including the microwave link, five color cameras, and a microprocessor-based ¾-inch editing system, cost less than $35,000. Some support for programming comes from other entities.

Cable and Higher Education

Michigan State University

Michigan State University's involvement with cable began in the early 1970's, when the university participated in the franchising process and was assigned two cable channels to program. A few years later, the East Lansing cable system interconnected to nearby systems in Lansing and in Meridian Township, greatly increasing the number of students who could be reached and making cable TV even more attractive for instructional purposes.

Currently, MSU's channels carry 100 hours of courses each week. To provide students latitude in scheduling their classes, several courses are repeated at different times. Some students watch the repeats for reinforcement or review.

Most of the courses seen on cable are illustrated lectures originating from a specially equipped lecture hall with four color cameras. Programs may contain dramatic vignettes, live microscopic studies, farm and wilderness situations, business experiences, and interviews with national authorities. The instructional and public television department sometimes travels to other States to gather video material. According to Robert Muhlbach, manager of instructional programming,

> Campus distribution is provided by means of cable interconnection among a number of University buildings. The system carries instructional television materials into more than 200 dormitories, on-campus classrooms, and laboratories in 26 buildings. The coaxial cable system handles 12 channels. An antenna system makes it possible to feed these channels with any of the local television stations throughout the campus network. Also, the local CATV system can be fed into the campus system.[3]

[3]"NFLCP 3rd Annual Convention Access Facilities Tour" (East Lansing, Mich.: *Instructional Television*, Michigan State University, June 27, 1980), p. 2.

Muhlbach wants to add some noncredit continuing education offerings on cable to fill unmet needs in the community, including such programs as a French language news service with news and stories from French television. He also hopes to acquire a large-capacity message generator. In the 20 minutes between classes, a large amount of information can be displayed to keep the community informed about campus events and classes.

Recently MSU joined participating cable systems throughout Michigan to deliver a teleconference on Michigan's taxation system. Under MSU's Cooperative Extension Service, the 2½ hour teleconference joined experts on campus with the public via satellite, cable, and telephone. Viewers could watch in their homes or at eleven remote sites connected by telephone to the panel of experts on campus. Funds for the demonstration came from MSU, Home Box Office, and United Cable Television Corporation of Mid-Michigan. MSU's future plans include a microwave hop to a Detroit satellite uplink to enable MSU to distribute programming to seven learning centers throughout Michigan.

Education by Satellite

An increasing amount of material for credit and for continuing education is being disseminated by satellite. Among the national programming services now operating are the Appalachian Community Service Network (ACSN), the National University Consortium, public television's PTV-3, and the American Educational Television Network (AETN).

ACSN provides a package of programming to cable operators, who pay one cent per month for each subscriber on their system. Programming now totals more than 60 hours a week and includes undergraduate, postgraduate, and continuing education courses accredited by nearly 70 colleges and universities. Institutions offering credit for ACSN courses pay $25 for each undergraduate student and $40 for each graduate student enrolled. Some ACSN selections are designed for professional continuing education; others are community service programs, not for credit. More than 40 States carry ACSN programming, which can reach a million homes.

Another satellite service designed primarily for distribution by cable is the American Education Television Network. AETN, a commercial enterprise, offers professional and training programs for physicians, dentists, nurses, other health professionals, lawyers, accountants, realtors, and others whose license requirements include updating and continuing professional education. Cable operators receive payment for carrying AETN programming. Student fees and corporate underwriting support the network, which permits a sponsoring corporation to display its logo or insert "infomercials" on particular programs.

Other program services are designed for dissemination over either public television or cable. One of these, the National University Consortium (NUC), uses print materials and optional tutoring to supplement TV courses accredited through participating colleges and universities. NUC is

based at the Maryland Center for Public Broadcasting.

Another recently launched programming service is PTV-3, which offers credit courses over public television. Future plans include expansion to cable systems and carriage of noncredit and professional continuing education programs. PTV-3 courses are offered in cooperation with local colleges and universities, which pay a licensing fee to the local PBS station and PTV-3 network.

The University of South Alabama has decided to go directly to the source for foreign language materials. For $6,000 it bought its own parabolic antenna, on which it can receive satellite programs from nine foreign countries. The programs are distributed throughout the campus on the university's cable system. Programs are used to augment studies in history, political science, sociology, and international studies as well as foreign languages. According to Glen Gleaves, project director, "The programs already are being used in the language laboratory and in classrooms, and will soon be available in dormitories, allowing students to receive evening and weekend foreign-language programs."[6]

Educational Uses of Interconnected Cable Systems

Regional interconnection of cable systems has particular appeal for educators. At the K-12 level, school district boundaries are not always the same as cable franchise areas, which means some schools in a district may receive cable while others do not. Schools associated with higher and continuing education also want interconnection to be able to reach a wider audience.

Some of the systems already mentioned have types of interconnection. The cooperative cable system in Trempealeau County, Wisconsin, holds all the cable franchises in the county. Michigan State University can reach several communities because the commercial cable systems are interconnected, and it is seeking wider outreach by satellite.

In Pennsylvania, an educational microwave/cable network is developing to interconnect cable systems throughout the State. The network, called Pennarama, currently reaches cable systems in central and eastern Pennsylvania. At present, Pennarama carries programming 24 hours a day to more than 150,000 cable television households in more than 60 communities. Plans are to interconnect cable systems statewide by early 1983.

Pennarama began in the late 1970's as a joint enterprise of Pennsylvania State University and the Pennsylvania Educational Communications Systems (PECS), a nonprofit group of cable TV operators. PECS supplies the microwave network, and Penn State manages the program service, which will serve colleges and universities throughout Pennsylvania.

Programming on the network has included telecourses produced at

[6] "Foreign TV Programs Via Satellite Ease University's Language Instruction," *Chronicle of Higher Education*, December 16, 1981, p. 3.

Penn State and material from the National University Consortium and the Appalachian Community Service Network. Penn State is looking forward to producing all its own courses.

Although groups in other States and regions have talked about such an interconnection, Pennarama is the first to be close to implementing a network. Others will be watching and learning from Pennarama's approach to continuing education, particularly for its emphasis on serving a special geographic area as schools have traditionally done.

Using the Institutional Network for Education

The institutional network can be used by schools for in-service training, districtwide teleconference meetings, and data transmission. Schools can also use the network to deliver tape and films to classrooms from a central source.

Students can interact with other locations on the network; for example, an elementary class can "visit" the police station. High school government classes can interact with officials at city hall. In fact, they already do in Reading, Pennsylvania, where students also interact with senior citizens at centers connected to the network. In Kettering, Ohio, the Medical Center for Community Health Education has used the institutional network to transmit information on nutrition from the center to second graders in schools.

In Irvine, California, a two-way institutional network has been in operation for several years. The schools have 26 locations on the two-way, audio/video institutional network, which also includes the city hall, the city library, and the University of California at Irvine. Each school has simple-to-use equipment loaded on a cart for easy mobility. Classes on the network can originate from anywhere in a building, often with only elementary school students at the controls. The system is decentralized, which means that there is no central switching location. Only two sites can interact at a time, but the other locations can be watching and can signal if they wish to interact. When that happens, one of the original sites switches to receive-only.

The schools use the network for instruction and for informal interaction among students at different schools. Craig Ritter, coordinator of video communications for the schools, suggests that when used in the informal mode, "students, who may suffer from a history of maladaptive behaviors and are stereotyped by people with whom they relate on a daily basis, have an opportunity to create whole new relationships and can start anew with students living in other neighborhoods."[7]

Kimberly Burge, television coordinator at the University of California at Irvine, has taught art classes on the system. She describes the way it worked for her classes:

[7]Craig Ritter, "Irvine Project Puts Kids in Control of Futuristic Technologies," *Community Television Review*, January, 1981, p. 18.

Each week small groups of upper elementary-level students gathered in hallways, classrooms and media centers at four district schools. For an hour, the 30 or so students met on the fully two-way cable television system with each other and with me, their Interactive Imagery instructor. Using the dark felt pens and construction paper, students drew the images that appeared on the two interactive video television screens. Sometimes the screens were used as tracing tables for image production. Often students posed as models for classmates physically located cross town. Students were encouraged to make suggestions for the choice, placement and lighting of objects as they were viewed at each location. Student television technicians occasionally stopped drawing to adjust camera angles, pass microphones and manipulate light and audio levels. Then they displayed their work for comparison and evaluation via two-way television.[8]

Burge also has used the system with teacher education classes at the university. Without leaving the campus, students look in on classes of the Irvine Unified School District. When the public school class ends, university students use the two-way system to discuss teaching techniques with the classroom teacher.

Summary

Educational institutions will find increasing uses for cable technology as more communities are wired and as interconnection of cable systems becomes more common. Currently, all levels of educational institutions are pioneering new ways to provide services to students and community members, and their experience will provide the basis for even more significant and widespread applications of cable to education.

[8]Kimberly Burge, "Interactive Imagery," in *Cable Television and the Arts* (Durham, N.C.: NFLCP Press, 1981), p. 1.

9

Health Uses Of Cable

By

Charlotte Bliss

Chapter 9: Health Uses of Cable

The applications of cable television to health and medicine are just beginning to be explored. At this writing, there are few if any health uses of cable television institutional networks. Some health institutions, however, are programming on subscriber networks, and many others are using other means of transmission to provide programming that could be delivered by cable.

Background

Although cable has not been used for health applications until recently, the link between television and medicine dates back to 1949 when television was used at the University of Kansas Medical School. Interactive television was first used in medicine in 1951 with a live color transmission between New York and Los Angeles that included a question and answer session. The regular use of telemedicine began in 1964 with a prototype of the Nebraska Veterans Administration Television Network, NEVATV.[1] Telemedicine experienced rapid growth in the late 1960's and early 1970's financed by funding from Federal agencies concerned with health care, telecommunications, and related technologies. These projects used microwave, satellites, and cable.[2]

In the early 1970's, Teleprompter provided a 1.5-mile dedicated two-way cable linking the Wagner Child Health Station in East Harlem, New York, to the Mount Sinai Medical Center. The objectives of the project were to determine (a) if the system would gain acceptance by health providers and consumers, (b) if it could be effectively and efficiently utilized as an option to direct physician-patient contact, and (c) if it would be cost-effective.[3] Teleprompter also sponsored a brief experiment in Rochester, Minnesota, in the late 1970's linking the Mayo Clinic via microwave to a tower enabling connection with hospitals in Winona, Minnesota, and La Crosse, Wisconsin. Audio was provided by telephone in this closed-circuit configuration.[4]

In the early 1970's, interactive cable linked the Lakeview Clinic and the Ridgeview Hospital in Waconia, Minnesota, with a clinic in Jonathan, Minnesota, about thirteen miles away. The objectives of this project were to

[1]J. Pfitzer, W.R. Gust, "A Description and Evaluation of a Ten-Station, Highly Utilized, Two-Way Television Health Network," in *Teleconferencing and Interactive Media*, eds. L.A. Parker and C.H. Olgren, (Madison, Wisc.: University of Wisconsin-Extension, 1980).

[2]Microwave projects included Massachusetts General Hospital-Logan Airport, NEVATV, and Interact (in Vermont and New Hampshire). Satellite projects included a series on experiments conducted on ATS-6 (the Alaska Health Experiment and WAMI at the University of Washington in Seattle) and STARPAHC at the Arizona Papago Indian Reservation. Cable projects are mentioned in the text.

[3]J. O'Neill, J. Nocerino, and P. Walcott, *Benefits and Problems of Seven Exploratory Telemedicine Projects* (Washington, D.C.: Department of Health, Education, and Welfare and the Mitre Corporation, 1975). Also, Ben Park, *An Introduction to Telemedicine* (New York, N.Y.: New York University, 1974).

[4]Ibid; conversation with Teleprompter staff.

(a) test telemedicine's superiority to the use of the telephone; (b) determine savings in time and travel for physicians; (c) determine its ability to increase physician availability throughout the health care system; (d) allow for a more personal relationship to develop over distance between the primary physician, consultant, and/or the patient; and (e) determine if its use would facilitate development of a health care system serving a rural population.[5]

Although the application of cable technology encompasses a broader scope of services than is available in "traditional" telemedicine, it should be kept in mind that cable applications are often in a formative stage and may have been demonstrated only on a trial basis. Cable's use in the delivery of health care services could learn from telemedicine, making adaptations in programming mindful of users and the medium. Like telemedicine in its early stages, cable may do more than provide new channels for existing patterns of communication—it may facilitate communication that has never before been possible.

Health Uses in Pittsburgh[6]

The Hospital Council of Western Pennsylvania, which represents 17 Pittsburgh hospitals, was active throughout the Pittsburgh cable franchising process. It participated in a needs assessment, formed a task force to discuss needs with companies applying for the franchise, and wrote a position paper that was included in the city's request for proposals. Based on this effort, the health community received a public health care channel on the subscriber network and a channel on the institutional network. Warner Cable, the franchisee, also stated it would provide a character generator for the hospitals to use for alphanumeric programming. The main access studio, neighborhood access studios, and production van are also available for hospital use at no charge.

After Warner received the franchise, it contacted the Health Education Center, a Pittsburgh health umbrella organization. The Health Education Center wrote to area health institutions asking them to send representatives to meet and discuss uses of cable television. This group became an advisory committee to Warner and has worked with the cable company to develop programming for the subscriber network's health care channel.

Programming on the health care channel is produced by area hospitals and the Pittsburgh Hospital Cable Coalition. Programming is available eight hours a day on the channel and includes interviews, demonstrations, and productions by hospitals to explain the services they offer. This is supplemented by preproduced programming available from associations such as the American Hospital Association and the American

[5]Ibid.

[6]Based on conversations with Susan Fink, Western Psychiatric Institute and Clinic, and William Horvath, Hospital Council of Western Pennsylvania; William Horvath, "The Pittsburgh Experience," in *Why Is Community Cable Television Important to Hospitals?* (Chicago, Ill.: American Hospital Association, 1980).

Heart Association. Alphanumeric programming includes basic information such as when and where clinics will be held.

Pittsburgh's institutional network will commence operation in the spring of 1982. The institutional health channel was granted to the Hospital Council of Western Pennsylvania, and Warner has been working with the council, particularly in planning hospital interconnects. The institutional network will link the council's 17 hospitals and provide a variety of services. Alphanumeric programming will announce meetings and educational sessions. Two hours a day will be devoted to satellite services, offering programming in professional and continuing medical education as well as national teleconferences. The satellite services will be provided by the American Hospital Television Network, a consortium of medical institutions. It is anticipated that within the next few months, a Pittsburgh hospital will program daily or weekly teleconferences of grand rounds, a program that will be available to city hospitals. The Hospital Council also anticipates offering six to twelve hours a day of patient education on in-house channels. Telediagnosis, teleconsultation, electronic mail, security services, data transmission and retrieval, and the transmission of tests are seen as optional services available on the institutional network.

Health Uses in Spokane[7]

Health care providers and school and community health educators began meeting in mid-1976 to discuss providing health information to the citizens of Spokane. A consortium of health care professionals grew out of these discussions, and by the fall of 1977 the Community Health Education Consortium (CHEC) was organized as a private nonprofit organization. In early 1978, the CHEC board of directors realized that the public could be reached by using Spokane's new cable television system. In late 1979, after many meetings and considerable planning, CHEC began programming two hours nightly (7 to 9 p.m.) on Cox Cable Spokane's channel 12, its health and wellness channel.

The CHEC membership saw a need for health education programming because Spokane and the surrounding areas have unusually high rates of heart disease, multiple sclerosis, teenage pregnancy, and deaths from car accidents. Surveys indicated that many minor health problems can be prevented or taken care of at home.

CHEC's telecommunications committee seeks diverse, quality programming pertaining to consumer health or wellness education from the 30 member institutions. About ten percent of programming is produced by member institutions. Negotiations for programs obtained from outside sources seek to include unlimited replay rights as programs are replayed at different times throughout the day.

[7]Based on a conversation with Walter Schaar, Cox Cable, and CHEC's Telecommunications Information Packet.

The telecommunication committee's preview subcommittee screens programs for content and technical standards using "objective non-censorious criteria." General criteria, for instance, include seeing whether the program is without advertising, profanity, and ethnic or sex bias; and whether the content is valid, soon to be outdated, well-organized, and of interest to the audience. CHEC notes that programs are rarely rejected, although rejection may occur due to poor technical quality or if the program's information "is incomplete or outdated so as to misinform or inadequately inform the viewing audience."

Following a successful preview, a program may be booked by completing a program request form at least six weeks prior to the desired air date. CHEC members are charged minimal fees to use the channel. Nonmembers may also program the channel and are charged more for channel time.

The preview subcommittee also acquires programming materials for a software library. The software library provides health information materials that are shown to fill channel time not otherwise sponsored. CHEC has found that few well-produced programs are available that deal with wellness and that portray consumers as active and responsible for their state of health.

Health educational programming, including programming by health agencies, is also offered on five dedicated educational channels. These channels are programmed by the Cable Advisory Board for Learning and Education (CABLE).

CMITS: Central Maine Interactive Telecommunications System[1]

The Central Maine Interactive Telecommunications System (CMITS), which began operation in 1977, does not use cable but links five hospitals, a university, and a family practice residency program by microwave. Slow-scan television is used in conjunction with audio to link CMITS with other hospitals throughout the country for information and education sessions.

The programming includes meetings, continuing medical education, credit and noncredit courses, nursing programs, and educational programs available via satellite. Two hospitals, the Lewiston Hospital in Lewiston and the University of Maine Hospital in Augusta, are both having discussions with their cable companies about providing health programming on the cable subscriber network. The Augusta cable system may also include institutional network applications.

[1]Based on a conversation with Anne Niemiec, CMITS, and articles by her: "Central Maine Interactive Telecommunications System: Communication and Craft," and Robert Cowan, "The Evolution and Integration of Interactive Telecommunications in the Systems Approach to Health Care Delivery," in *Teleconferencing and Interactive Media*, eds. L.A. Parker and C.H. Olgren (Madison, Wisc.: University of Wisconsin-Extension, 1980).

The unique aspect of CMITS is that it is a user-operated system. Robert Cowen, a former director of CMITS, developed a model for this system based on a belief that users should be involved in development, evaluation, and accountability of telemedicine systems. He also thinks that systems should add to the use of other existing communications systems, and that use of a multipoint system should allow program origination from the most appropriate point.

His model also envisions technological development that will provide equipment that is far easier to use than has been the case in other configurations, reducing dependence on nonmedical professionals in systems operation. The model projects a communications system that will have maximum flexibility, allowing any point on the system to interact or originate programming with any other point or points on the system. Cowan is aware, however, that the successful application of this model depends on "demystification of the technology for the users and creative guidance to lead the users beyond their stereotypes and into a region where interpersonal communication is the preferred mode."[9]

Anne Niemiec, assistant project director, describes the CMITS system this way:

> The System is oriented toward actual user operation with a minimum of technical intervention. Each participating facility has been provided with identical equipment so that programs may originate from any location with equal ease. Controls and layout of the equipment were made as simple as possible to minimize some of the tension which accompanies the initial use of new technology. The System also provides for exceptional confidentiality since only stations specifically selected by the originating site can view or hear programs in progress. A site may send a picture to one, all, or any combination of the sites. It is possible for three separate two-way television conversations to take place simultaneously.[10]

The egalitarian nature of CMITS is integral to the system. Any site may originate or transmit programs and is expected to do so. There are no major medical centers or teaching hospitals in the system.

The cooperative nature of the system originates with user groups, composed of representatives from various areas of the hospital, ranging from social work to nursing to plant operations directors. Each group meets on CMITS to identify areas of possible programming before going on to design, produce, and evaluate the course or program. By having the users themselves determine, plan, implement, and evaluate their programs, the user-operated aspect of the system is reinforced. It is also a way to expand the interdisciplinary focus, as well as to provide a way to bring more people into the system.

[9]Ibid.
[10]Ibid.

Evaluation is an important part of any CMITS program. An attendance form gathers numerical information, and an encounter form asks users about program "relevance, accessibility, visuals, overall rating," suggestions, and comments. In addition, more extensive evaluation forms are used following courses programmed over the system. Follow-up evaluations are conducted six weeks after the course has been completed. Suggestions are given to appropriate user groups for consideration. Instructors hold evaluation meetings both during and after courses in an effort to implement responses to the feedback provided in the evaluations.

Each participating site employs a media specialist who is responsible for seeing that users are trained in system operation. The training may come from the media specialist, other users, or "competency lists" and a manual. New hospital employees receive an introduction to CMITS as part of their orientation.

Summary

Cable can offer health care information, training, and education to health professionals and cable subscribers. The health care community, like educators can develop many service and administrative applications for cable, using both the subscriber and institutional networks. Health uses of cable are still in development, although the health and medical fields have been using other technologies for "telemedicine" for many years.

10

Telecommunications Needs Assessments

By

Harriet Moss

Chapter 10: Telecommunications Needs Assessments

For years, health and social service agencies have conducted needs assessments to gather information used in planning new services. As the telecommunications field grows, more and more municipalities and cable companies will use needs assessments to identify the feasibility of new cable services in the community.

Correctly conducted, a needs assessment will identify not only the general issues facing a community and the communications services it might use, but it also will define community needs and problems, pinpoint existing resources, educate the general public about new and useful technologies, and suggest technological solutions that cable (or other communications media) might provide. Needs assessments are often conducted by both the municipality and the cable companies in conjunction with franchising and refranchising activities. Municipalities can use the results to set requirements for system design, function, and performance in the request for proposals (RFP). Companies use the results to formulate bids that are responsive to the needs of the area.

Community Telecommunications Needs Assessors

Ideally, in conducting a community telecommunications needs assessment, the assessors should possess two general areas of knowledge. The first is knowledge of the community being surveyed. The second is knowledge of technologies currently available and a sensitivity to the problem-solving uses of those technologies. Because it is sometimes difficult to find persons with strong backgrounds in both areas, assessments can be conducted by teams, which can include consultants who design and implement the assessment and community members who provide background and support to the consultants and act as liaisons with the community.

Assessment Methodologies

Identifying Users

The first step in conducting a community telecommunications needs assessment is to identify potential users to contact and interview. There are several ways to do this. The first method is the systems approach suggested by Tom Wolfsohn and Peg Kay in *The Cable/Broadband Communications Book.*[1] This "snowball" technique consists of identifying a "seed" community organization, interviewing everyone within that organization, and obtaining from the interviews names of other organizations within the community to interview. Those organizations then suggest other organizations, and the snowball grows as needs and problems are traced through a community. Wolfsohn and Kay maintain that this approach has two main ad-

[1]Mary Louise Hollowell, ed., *The Cable/Broadband Communications Book. Vol. 2.* (Washington, D.C.: Communications Press, 1981.)

vantages. First, by interviewing everyone within the need organization, a large pool of contacts for subsequent interviews is established. Second, by interviewing what is essentially a vertical sample, a wide range of perceptions and contacts is uncovered. The main drawback to this technique is that it is time-consuming and may not be practical where assessment time and staff are limited.

The second method for identifying potential users is somewhat more discriminatory, but useful when a needs assessment must be completed in a short time. It consists of using lists of schools, community organizations, and municipal offices (usually obtainable from libraries or local governments) and choosing several organizations to interview in each of the following areas: city and county governments; community services (including senior citizens, women, youth and handicapped organizations); arts and humanities groups; businesses; health services; and educational, minority, and religious groups. From these initial interviews, more organizations can be identified and interviewed. The advantage to this approach is that a variety of interest groups can be polled in a relatively short amount of time.

A third method, effective in identifying interested individuals as well as organizations, is to publicize the needs assessment, explaining its purpose and goals, and then hold a series of public meetings. Public meetings have several advantages. First, the assessment process becomes open to input from individuals and organizations not previously contacted. Second, there is a sharing of ideas among the group of attendees that often generates a level of excitement not present in one-to-one interviews. Third, a relatively large number of persons can give their views in a short time. And fourth, public meetings are an effective way to educate many people at one time about cable television and its uses.

It should be noted that most cable systems being built or rebuilt in the 1980's will incorporate institutional networks. Municipalities and cable companies are becoming increasingly aware that ascertainments should be conducted among public agencies and commercial firms that are potential users of this specialized communications network. This type of ascertainment differs in several ways from one concerned with potential uses of a subscriber network. First, the subjects of the ascertainment are the user groups that will be passed by the institutional network, rather than the whole community. Second, the structure of the communications involved is different. Little or none of the communications content of an institutional network will be provided by the cable company; the users will supply the content. Third, the mix of the communications is different, involving little or no entertainment or home-use programming but substantial amounts of voice and data in addition to special-purpose video for such applications as training and teleconferencing.

Institutional network applications involve substantial interface with computer communications and with a swiftly growing segment of telecom-

munications usage and technology known as local area communications networks (LACN). LACN's involve business communications on an intraoffice or intracity basis. For all of the above reasons, substantial knowledge of current communications network configurations and technology is an important requirement for successful institutional network ascertainments.

Certain entities, such as schools, fire departments, and municipal agencies, will need to use both the institutional and subscriber networks. Thus, the ascertainment team must have the technical expertise to identify appropriate users and uses for each network and the capability to analyze needs in terms of the potentials of each use.

Gathering Information

After potential users have been identified, there are several ways to contact them. The first is through a mail survey, best used for gathering quantitative data (for example, how many people the organization serves per year, whether it has access to video production equipment, whether anyone in the family/organization has ever operated a computer terminal, etc.). In addition to supplying information, a mail survey is an effective tool in publicizing the needs assessment, and a cover letter can explain the issues involved. It should be noted, however, that a mail survey has many limitations and does not provide in-depth information. It is best used in conjunction with other information-gathering techniques.

The second, and most effective method is personal interviews. These interviews should seek to discover:

- What the interviewee does in his or her job;
- What the interviewee's organization does and what its goals and objectives are;
- Who the interviewee communicates with during the course of his or her work; with whom the organization as a whole communicates, and how;
- What the interviewee perceives the organization's problems and needs to be, both in general and with regard to communications;
- What the interviewee perceives general community needs and problems to be;
- What communications facilities and skills currently exist within the organization (or in the community) that the interviewee knows of; and
- What the interviewee would like to see cable television provide for both his or her organization and the community as a whole.

In addition to uncovering more detailed information than mailed questionnaires can provide, personal interviews allow the interviewer to inform the interviewee about issues surrounding the needs assessment (such as how cable television works, how similar organizations have used cable

elsewhere, and which specific technologies are useful for what purposes). The interviewer also has a chance to solicit the interviewee's reactions to possible communications solutions occurring to the interviewer during the discussion. In doing this, however, the interviewer must be careful that the technologies she or he mentions do not automatically become the interviewee's organizational needs. She or he also needs to be sure that the same questions are asked of each person; otherwise the resulting data are difficult to correlate. Even so, personal interviews—both individual and group—are by far the best method of gathering information and educating potential users.

The Role of Assessors

One of the most important roles that persons conducting a needs assessment must play is that of community educator. Public education is an integral part of a thorough needs assessment. The better informed a community is on all aspects of cable television, the more useful the information will be that results from the assessors' subsequent interviews.

The second aspect of assessment is analysis. By the end of a needs assessment, the assessors must be able to analyze how communications within a community work; what the community's needs and problems are; how certain of these problems can be alleviated through various telecommunications solutions; and where different groups and organizations can share the same solution. Here is where all of the assessors' experience and knowledge of cable and its uses comes to bear. It is essential for the assessors to know which technological solutions really work and which just sound good, what equipment needs and programming projections are truly realistic, what different hardware options might be means to the same end, and so on. Analysis is the subjective part of the assessment process, and the thoroughness, accuracy, and creativity of the final report will reflect the assessors' skills.

The End Product

The needs assessment report should contain the following elements:

- A description of the methodology used in the assessment;
- A statement of the community's needs and problems;
- Proposed telecommunications solutions to the appropriate problems;
- Funding needs and options for the proposed solutions;
- A list of telecommunications resources already existing within the community; and
- A list of all organizations and individuals spoken with.

Depending on its purpose, the report might also include specific recommendations on training needs, programming suggestions, detailed equipment requirements, and possible system configurations.

Benefits

There has been a growing dissatisfaction among both municipalities and cable television companies with the "quantitative" approach to franchising. In many cases, if company A offers a community a $1 million institutional network and company B offers a network worth $2 million, company B may be rated more highly, even if its network design is not based on ascertained needs. Until recently, many communities looked on cable franchising situations as unlimited giveaways, and this kind of rating-by-dollar-figure evaluation approach greatly encouraged that attitude. One way to alleviate these pressures is for municipalities to conduct their own needs assessments before issuing an RFP. Specific benefits of a municipally sponsored ascertainment include information on the problems, needs, and resources within the community; the kinds of telecommunication technologies that might alleviate problems and improve the quality of life in the community; and increased understanding about the potentials and possibilities of current technologies.

Cable companies can benefit from their own well-conducted needs ascertainments in preparing their applications in response to RFP's. A company-sponsored needs assessment will create a higher level of community awareness and respect for the company and its services; secure information on what services are needed, desired, and potentially profitable; stimulate novel and creative ideas for useful telecommunications applications; and provide information useful in designing a system configuration.

Following are four needs assessment case studies. Of the four, one assessment was conducted by a cable television company, two were done by cable cooperatives, and one was sponsored by a coalition of arts groups. The costs of these different assessments vary widely; where possible, a cost figure is given and the pros and cons of each approach are discussed.

Case Studies

Case Study A: Davis, California (40,000 population)
Sponsored by: Davis Cable Television Co-op

In June 1981, the Davis City Council granted the Davis Cable Television Co-op a franchise for the city of Davis, conditional upon their conducting a feasibility study and proposing a cable system acceptable to the council. The Co-op realized that to design the kind of responsive cable system that the city council wanted, they would need not only technical design and marketing studies, but information on potential institutional network and local programming uses. To gain this information, they hired two consultants to design and implement a five-week community needs assessment.

The consultants realized that their main difficulty would be limited time available to conduct the assessment. Thus, they arranged with the Co-op's project manager to hold a press conference to give the assessment

high visibility in the community, and to counteract anticipated problems caused by the lack of time for preliminary community education activities. This strategy was used throughout the process, and stories about the assessment's progress appeared at least once a week in both local papers, as well as in the local university's student newspaper.

The consultants spent one week compiling a list of all the nonprofit and city-related organizations in Davis. A questionnaire was sent to all of these, along with a cover letter explaining the process and announcing a series of public meetings. This list was also given to Co-op board of directors and to several city officials, who prioritized the organizations to be personally interviewed. The consultants divided the community into eight broad interest areas and used the combined ratings to determine which organizations to interview in each area. In all, more than 70 organizations were spoken with over the subsequent 3½ weeks.

Most of these were in-person interviews, but a few were over the phone and some were group interviews. In areas such as sports and the arts, where there were several of smaller organizations with similar interests, the consultants, with the help of key organizations in those areas, organized group meetings in addition to their regular interviews. During all interviews and meetings, the consultants handed out community education packets consisting of articles on cable television and its various uses.

One large element in the Davis needs assessment was the University of California-Davis, whose 18,000 students make up nearly one-third of Davis's population. Before the consultants' arrival in Davis, a student task force on cable television had been formed. During the first and second weeks of the assessment, the consultants met several times with the task force, which was to do its own assessment of on-campus student needs. At these meetings, the consultants showed the task force videotapes, explained with cable television technology, and briefed them on using the questionnaire they had devised for the campus community. The information gathered by the students, in addition to that received by the consultants during their interviews with university administrators, was the basis for the consultants' subsequent recommendations on university uses of the proposed cable system.

Near the end of the assessment, the consultants held three well-publicized public meetings on cable television and its uses. These were designed to allow questions and input from the general public, as well as from interested organizations that hadn't been interviewed.

Most of the fifth week of the assessment was spent drafting a preliminary set of recommendations. This first draft was given to the Co-op's board of directors for questions and comments. Then a final report was written that included specific equipment, facilities, and design recommendations for both the institutional network and the system's local programming component; specific equipment recommendations for the various organizations and organizational areas; staffing recommendations; channel

allocation recommendations for both institutional and subscriber loops; and a section on assessment methodology. This report, which cost the Co-op less than $10,000, formed the basis for all of the community use aspects of the Co-op's proposed cable system design.

Pros and Cons. The main advantage to this approach was that by using two full-time consultants, a great deal of detailed, in-depth information about community needs was generated in a short time. Because little volunteer labor was used in the interviewing process, the consultants didn't have to spend time training volunteers or interpreting someone else's interview results.

The major disadvantage to this process was the lack of time to do community education before conducting the interviews. The more aware a community is about cable television and its uses, the easier it is for an assessor to get useful information during the interviews.

Case Study B: Dallas, Texas (879,000 population)
Sixteen arts organizations.
Sponsored by: Dallas Arts Combine

When cable television came to Dallas in 1980, the Dallas Arts Combine, a coalition of 16 arts organizations, decided to conduct a needs assessment to determine how their members could best use cable. To this end, they received a $20,000, six-month grant from the Meadows Foundation to hire a consultant and a part-time project staff consisting of a project director, an interviewer, and a secretary.

The consultant's initial task was to design the overall assessment plan and to train the project staff in the skills needed to conduct the assessment. The project staff also began attending video production classes to round out their cable education.

The first step in the assessment process was a one-day seminar designed by the consultant and held for Combine members. More than twenty attendees watched videotapes, listened to speakers, and learned how arts groups around the country were using cable television and how groups like theirs could use cable in the future.

The next step in the process was a series of individual followup workshops, one each for most of the Combine's sixteen member organizations.[2] These workshops were conducted by the project interviewer, along with the member(s) of the organization who had attended the initial seminar.

A week after each organization's workshop, the interviewer, using the consultant's questionnaire, interviewed two to four staff members from that organization. Some of these interviews were group interviews, and some were done on an individual basis.

[2]A few of the smaller organizations had sent their entire staff to the initial seminar and needed no further workshops.

After the interviews were completed, the project staff sent copies of the finished questionnaires to the consultant, who then compiled a preliminary set of recommendations for each organization. A copy of this draft report was sent to each participating organization to read and discuss.

Subsequently, a second large seminar was held for Combine members. At this event, speakers discussed ways of working with artists and unions and the existence of various national programming and support organizations. Also, the consultant received feedback on the draft report.

Armed with each organization's comments, the consultant wrote a final report. This report included information such as facility and personnel needs, programming suggestions, and further research needs for each organization.

Pros and Cons. The major advantages of this needs assessment were that it was extremely specific, well funded, and had a reasonable timeline. Because of these factors, a great deal of education could be done both with the project staff and with each of the sixteen organizations. In addition, there was time to conduct interviews with several people in each organization. All of this resulted in generating good information for the consultant and excitement about cable television among the Combine's members.

Case Study C: Milwaukee, Wisconsin (630,000 population)
Sponsored by: Community Controlled Cable Cooperative (Five C's)

To conduct its needs assessment for Milwaukee, the Five C's Co-op established a 12-person programming committee, composed of board and Co-op members representing various interest segments of the community. Several months before their franchise proposal was due, one of the Co-op's franchising consultants designed a needs assessment process that could be conducted by community members in a relatively short period.

The consultant's first job was to educate the programming committee about cable television in general. To this end, a one-day seminar was held at which an overview of cable television and its uses was given, videotapes of various kinds of local programming were shown, and the needs assessment process was discussed. The community was then broken down into eighteen interest areas (for example, health, children, transportation, neighborhood affairs), and each member of the committee, along with several additional board of directors members, was assigned an area. For each area, the consultant had designed a specific questionnaire, and the rest of the seminar was spent in discussing how to conduct the interview for each type of questionnaire. The committee members left the seminar with the understanding that they were each responsible for identifying key organizations in their areas; selecting, with the consultant's input, ten to twenty of those organizations to talk with; and then conducting the interviews.

Recognizing that not all of the organizations could be personally contacted, the committee also mailed a questionnaire to every nonprofit group in the city.

Several days after the seminar, the committee members began their interviews. For a few of the more important ones, the consultant accompanied the committee member, but by and large the members were on their own. Several of them formed advisory minicommittees to assist in the identification and interviewing process in their area. A few of them showed the videotapes they had seen during the training seminar to their interviewees.

As interviews were conducted, photocopies of the finished questionnaire were sent to the consultant, who provided feedback on methods and results, both over the phone and in her five or six trips back to Milwaukee to work on the proposal. The board of directors was also kept apprised of the committee's progress.

After about six weeks, all of the interviews were completed. The consultant, after analyzing all the resulting data, drafted a preliminary report containing three to eight pages of recommendations for each interest area. This draft went to both the programming committee and the board of directors for corrections, additions, and deletions. The consultant then completed a final report, which was used (along with organizational position papers in the RFP and suggestions from a local access group) as the basis for all of the community use aspects of the Five C's franchise proposal.

Pros and Cons. There were several advantages and disadvantages associated with the process used in this needs assessment. The main advantage was that the persons actually conducting the interviews and doing the legwork (i.e., the programming committee) were community members themselves. They already knew Milwaukee and its organizations, and when many organizations were closing their doors to other cable company representatives, committee members had no problems gaining interviews. And because they were generally known to their interviewees, they had to spend less time getting over the initial distrust that often occurs in such situations and could get in-depth information more quickly. Another advantage was that a large amount of work was done in a very short time at very low cost, due to use of local volunteer labor. A third advantage was that members of the programming committee became extremely knowledgeable about cable television and could use that knowledge in the future when Milwaukee was wired.

The main disadvantage of this process, according to the consultant and the committee, was the lack of time to hold community education activities. The entire assessment was conducted over a two-month period, and as a result the committee had to depend on the public education work the city itself had done.

Although not cited by the consultant in this case, one other disadvantage frequently occurs in situations where assessments rely heavily on volunteer labor. That problem is the lack of control the consultant has over the information received from the interviewers. Even when the volunteers are trained and given detailed questionnaires to work from, it is virtually impossible for them to gather the same kind of in-depth information that

the consultant can; in addition, it can be time-consuming and frustrating to interpret someone else's interview results.

Case Study D: Portland, Oregon (370,000 population)
Sponsored by: Rogers Cablesystems

When Rogers Cablesystems decided to compete for the Portland franchise in mid-1979, it formed a franchising team to spearhead its efforts. This team was composed of a project head from Canada, who knew both cable and the Portland area; and several Portland residents, some of whom knew about cable and some of whom knew about the community. This local staff began attending all of Portland's public meetings on cable to get an idea of which community groups were interested in becoming involved in the franchising process. At the same time, they began pulling together special interest advisory boards (for women, the arts, seniors, educators, etc.). With input from these boards, suggestions from Rogers' local partners, and their own knowledge of the community, the staff began talking to community groups about cable. Using occasional help from franchisers in the Toronto home office, the staff also did local programming demonstrations, sponsored community workshops, and demonstrated new technologies.

After five months of the local staff laying the groundwork, a "crash team" was brought to Portland for ten days to get an even more specific idea of community needs and to come up with data on how the franchise proposal should be designed. This crash team was composed of seven people; some were local programmers from Canada and Syracuse (another Rogers system), and others were engineering, interactive, and data transmission specialists. Before they arrived, the local staff had identified groups and individuals for the crash team to speak with and had scheduled appointments for them. Upon their arrival, they were briefed by the local staff, and for ten days they interviewed community groups and institutions. During this process, some of the interviewers worked from the company's standard questionnaire; the more experienced interviewers used it only for reference. Each interviewer conducted two to three interviews per day, and at the end of each day they all met to share information, and discuss how it could fit together into a coherent system design. In all, more than 100 groups were contacted. At the end of the ten days—still three months before the franchise filing date—four members of the crash team returned to Toronto with the compiled information. One crash team member stayed on in Portland to help the local staff do followup work and act as liaison with the home office.

Of the four returning crash team members, two had primary responsibility for guiding the process of designing the system to be proposed for Portland. They did this through discussions about the Portland community and its needs with various home office franchising specialists who knew specific technologies, their uses, and their costs. Between the crash team

members' knowledge of Portland and the Rogers' knowledge of cable, a system design and subsequent franchise proposal were developed. (Rogers Cablesystems submitted their Portland franchise proposal in early 1980 and was awarded the franchise later that year.)

Pros and Cons. There were several obvious advantages to this assessment approach. The first was that a generous amount of time was allowed for community education before any in-depth interviewing began. The second was that the assessment used both cable specialists and community members in an effective way. The third advantage was the large amount of expertise in different areas of cable technology available throughout the assessment.

But there are also several disadvantages to this sort of process, the most apparent being its sheer expense. This assessment cost Rogers more than $100,000, a figure well beyond the reach of most municipalities and community organizations. Much of this money, of course, was spent for public relations purposes. Another disadvantage, voiced by one of the consultants involved, was that this sort of "razzle-dazzle" approach often creates false needs and unrealistic expectations within a community as to what cable television can and should do.

Skilled ascertainments can be conducted by reputable professional firms and consultants, without the dimensions of public relations, for far lower figures, within the reach of both municipalities and cable companies. At this writing, such ascertainments are routinely offered and conducted by experienced professionals at costs falling within the $10,000 to $25,000 range, depending in part on the size of the jurisdiction and the depth of effort.

Special thanks for case study information to Bill Coleman, Sallie Fischer, Jean Rice, Jon Schechter, John Velie, and Iris Young.

11

Vital Links: Interconnection Of Cable Systems

By

Linda J. Camp

Chapter 11: Vital Links: Interconnection of Cable Systems

Cable has experienced tremendous development over the past decade and a high level of excitement and optimism exists about its capability to deliver a variety of new services. Many of these services will be most cost effective and useful on a regional basis, rather than on a single local cable system. However, it is not economically or technically feasible to wire on and on from the headend. Signals can travel only so far through the cable until degradation over distances creates a natural end to the cycle. And since cable is normally franchised on a local basis, more often than not a system is limited to jurisdictional boundaries by the political process as well. Thus, for both technical and political reasons, cable interconnection can be an important consideration.

The term "interconnection" can have several different meanings in discussions of cable television. Broadly defined, interconnection refers to the linking of cable with other communication technologies to increase the capabilities of the system. Interconnection is also used to describe the linking of two or more cable systems, as well as the connection of hubs within an individual system.

Most of this chapter focuses on interconnection of cable systems. Hub interconnection is a design and engineering feature of modern cable systems and is described in chapter 1. Interconnection of cable and other technologies will be discussed briefly later in this chapter and is also described in chapters 3 and 5.

Benefits and Applications of System Interconnection

Although local orientation is one advantage of a cable communications system it is also a drawback. The limited reach of a single system means that services can be targeted to a clearly identified population—but not all potential recipients of some cable-delivered services will reside in a franchise area. In addition, cable's limited reach means that certain economies of scale enjoyed by other communications technologies are often not possible. By interconnecting systems, these limitations can be overcome so that both public service and commercial applications will be more likely to develop.

Community Programming

In the past, cable has been touted as a medium for community programming. Yet in some instances local origination programming has been slow to develop, partially because it is expensive. High-quality origination programming requires sophisticated equipment and facilities that can have an initial price tag of $500,000 or more. Ongoing costs of program production and skilled staff can run into the hundreds of thousands of dollars over the life of the franchise, depending on the scope of the effort. This amount

is a substantial commitment for any cable operation, but especially for small systems. Likewise, access programming can be expensive. Smaller communities may not have the resources to program a channel full time on an ongoing basis.

Interconnection offers at least one solution to the problems of high cost and underutilization of community channels. Where several systems are reasonably adjacent, it is possible to interconnect the access and local origination channels. Rather than building costly studios in each community, a single local origination facility could be constructed to accommodate the production needs of all those involved. Resources for access might be similarly pooled to avoid unnecessary and expensive duplication. Such cooperative efforts may prove to be doubly beneficial for municipalities that are similar in character or that have a history of mutual activities to reinforce existing ties or create new ones.

Some feel that one drawback to interconnecting community channels is that it may remove the local character of the channels. They may also feel that pooling resources in one location may make access equipment less accessible to residents of the other communities. However, this need not be the case. Through careful scheduling and educational efforts, the access staff can assure that all communities are actively involved. Portable access equipment "packages" can be placed in individual communities so that distance from the central facility does not deter community participation.

Institutional Users

Institutional users of cable systems have a great deal to gain from interconnected channels. Often such users provide services to audiences that are not contained within a single franchise district. In other cases, similar institutions in different franchise districts may offer the same service. In either instance, interconnected channels can help deliver these services in a more efficient and cost-effective manner.

A good example of an institutional application of interconnection is the distribution of higher education materials. By interconnecting an educational channel among many systems, it is possible to extend educational offerings to many students in an efficient manner. And, as with community programming, interconnection could help facilitate pooling of resources among institutions and make these educational services more cost-effective.

Modern cable systems frequently provide for a separate institutional cable that is used to link local institutions, agencies, and businesses. The interconnection of systems can help extend and enhance the kinds of services being offered through this kind of local loop. For instance, interconnecting the institutional loops of several systems can make it possible for all health agencies within a region to share materials. In addition to the cost savings, interconnection can contribute uniformity to areawide information and training programs.

More and more institutions are beginning to explore the possibilities

for data transfer via cable. They include local governments and libraries as well as education, health, and business institutions. Particularly in large metropolitan areas there may be a need to move data from city to nearby city. This kind of information transfer is frequently accomplished via phone lines. However, interconnected adjacent cable systems are another option.

Benefits to the System Operator

A key benefit of interconnection as seen by cable operators is the possibility of increasing revenues by attracting advertising support. National and regional advertisers frequently have bypassed cable because they would have to negotiate with several operators to reach a sufficiently large audience. Through system interconnection, larger audiences are possible, and potential revenues are equally large. Gill Cable's interconnect in San Jose, California (described later), helped the system to earn approximately $1 million in advertising revenues during 1980.[1] A new interconnect in Connecticut was estimated to have generated $100,000 over a three-month period.

Cable operators can profit from the opportunity to share the costs of staff, services, and equipment. The advantages of sharing local origination and access costs have already been described. Some of the other programming most in demand by subscribers is provided to operators via satellite. When systems are interconnected, satellite dishes (which can range in cost from $5,000 to $10,000) can be shared and jointly financed.

Operators may also find that interconnection makes it possible to offer new kinds of services. Such offerings as home banking and home shopping may become economically viable only when large numbers of subscribers can be served.

As with public service users, some commercial cable users may have a service with broad appeal to offer. Newspapers, for example, are experimenting with text information channels that could command regional audiences. Other commercial users, such as banks, might need to transfer data from one municipality to another. The potential for economic benefit is strong; for that reason, the private sector is likely to give serious attention to interconnected systems in the future.

Interconnection Configurations

There are several different levels of system interconnection. The first is the municipal level. The typical pattern across the country is one cable company operating in one community. In a few larger cities, however, several companies serve separate subdistricts. For these communities, the issue of interconnection is especially relevant, because interconnection is necessary to disseminate citywide information efficiently.

Beyond that, interconnections can be developed on a regional basis.

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[1]Susan Spillman, "Interconnects: The Numbers Game," *Cablevision*, March 9, 1981, p. 41.

Perhaps the most likely situation is the linking of systems within a metropolitan area (for example, a city with surrounding suburbs). However, countywide and even statewide interconnections are also developing. National interconnection of systems is possible, though economically feasible only with satellite technology.

Ownership and Management Options

It is fairly easy to identify potential uses and users of interconnected cable systems. But ownership and management structures are much more complicated because both touch on the sensitive issues of access to and control of the overall communication system.

There are three basic options for ownership of the interconnection technology: private ownership, public ownership, or some combination of the two. The existing interconnections are largely privately owned. In some cases, a single operator has financed the hardware, whereas in others participating cable companies have split the costs. Management has followed the same pattern, with either a single system assuming responsibilities, or with participants acting jointly. Sometimes an entirely separate corporation has been set up to manage the interconnect on behalf of all participating operators.

Public ownership of an interconnection has been virtually untested. However, it would seem an ideal approach if the primary goal of the interconnection is to deliver nonprofit public services. Municipalities might jointly own the interconnect, a separate nonprofit corporation might be established, or an existing State or regional agency might become involved. The specific options for a given area depend on the kinds of arrangements permitted under State and local laws.

Initial financing of a public interconnection could take several forms. Participating municipalities might each be assessed a share of the costs, or grant monies might be available. Given the pressures on local government budgets and competition for grants, however, these options may prove problematic. Another approach might be to issue municipal bonds. But again, some careful legal research would be necessary to determine what is permissible in a particular location. Joint public and private financing is also an option, subject to State and local laws.

Under public ownership, municipalities are unlikely to have the expertise needed to run an interconnect effectively. Thus the question of management is an important one. The kinds of functions that need to be performed include maintaining and upgrading the interconnect equipment, scheduling use of the system, promoting services, cablecasting programming, and carrying out other day-to-day operations. Participating cities can hire staff, but another approach might be to work out a separate management scheme by contracting with professional communication companies or arranging with participating cable companies to handle operational functions.

Whatever the ownership structure, an important issue is control of access to the system. Another issue is the type of use to which it may be put. Should the owner of the hardware be the gatekeeper? And if the owner retains control, what guarantees are there that both commercial and noncommercial services will develop? These questions are just beginning to come into public focus.

A new kind of ownership and management structure that has begun to emerge is a separate body that provides the interconnection and makes the channels available to both commercial and noncommercial users. The company recoups its costs by charging fees to users. Such an interconnection may be operated on a common carrier basis (i.e., universal access to channels, with a posted set of rates), thus eliminating problems of access to and control over the system.

Interconnection and Technology

Essentially, interconnection is a matter of distributing cable signals from one headend to another. Two basic types of technology can be used for interconnection: coaxial or fiber wire and broadcast technology. The selection of the technology depends on several factors, including distance, the terrain, number of channels, type of application, and availability of frequencies. It is possible that a combination of technologies will be needed to complete the link.

Broadcast Technology

The main "wireless" or "over-the-air" technology used for interconnection is microwave technology. Microwave radio operates at frequencies much higher than those used for broadcast television. The Federal Communications Commission (FCC), which licenses the use of these frequencies, has set aside a bandwidth (12.70 GHz to 13.20 GHz) for cable operators to use for interconnection and other purposes. This bandwidth is commonly referred to as the Community Antenna Relay Service (CARS) band. On rare occasions, operators use other microwave frequencies available on a common carrier basis from such entities as AT&T.

Interconnection via microwave simply involves placing a transmitting tower at some fairly central location to send signals to a receiving tower at one or more cable headends. From there the signals are distributed to households through the coaxial cable system. Very often the microwave transmitter will be placed at a cable system headend and will be equipped to switch signals to all systems involved. However, it is also possible to place the transmitter at a location separate from any of the headends. It would use an interconnection "facility" especially designed to receive, transmit, and switch signals to be distributed over the interconnected systems.

More than one channel may be interconnected with either several single-channel transmitters and receivers or a multichannel transmitter and receiver. A multichannel transmitter is more cost-effective when many

channels are to be interconnected. Up to 54 channels can be transmitted and received with this kind of technology. Whatever the equipment, each channel would require a different microwave frequency.

Microwave interconnection is suitable for audio, video, and data. Signals may be transmitted using either AM or FM modulation techniques. Each carries certain advantages and disadvantages.

FM microwave is better for video applications because of its high signal quality and reliability. However, it requires more bandwidth than AM microwave (from 12.5 MHz to 25 MHz rather than 6 MHz), and FM equipment is more expensive. FM microwave sidesteps cable channel frequency compatibility problems because the signals are separately modulated. A clear line-of-sight transmission path is needed, and the equipment is limited to a single hop distance of about 20 miles.

The advantages of AM microwave are that it conserves bandwidth and it is economical when many channels are needed. AM microwave is more susceptible to fading than FM microwave because of climatic conditions. To compensate for this fading, links are generally limited to approximately 10 miles. Cable channel frequency compatibility can be a problem, so that greater coordination among users is necessary and additional modulating and processing equipment may be needed.

Cable microwave frequencies are also shared with Fixed-Satellite Service (earth-to-space) and Television Auxiliary Broadcast Stations (linking the transmitter to the studio of broadcast stations). This, coupled with the fact that cable systems may be using microwave to interconnect the hubs of a single system, means that there is a limit to the frequencies available for interconnection in certain parts of the country. Thus, microwave interconnection, although an economical choice in some instances, may not be an alternative in all situations.

One other wireless interconnection technique should be mentioned, although it falls under the broader definition of interconnection (cable and other technologies rather than system interconnection). Occasionally an institution will lie outside of the franchise areas being interconnected. When this situation arises, a special technology may be used: Instructional Television Fixed Service (ITFS). This is a microwave system that transmits instructional programming from a fixed point to one or more fixed receiving stations. It was authorized by the FCC as a means for the local distribution of educational material by educational, governmental, and other nonprofit entities. By using an ITFS system, a university, for example, could transmit programming to a cable headend, and from there distribute it to all subscribers. ITFS systems can also be used to provide programming to facilities, such as public schools, in areas without cable systems.

Wire Technology: Coaxial Cable and Fiber Optics

Another technological alternative for system interconnection is coaxial cable. A typical configuration uses a one-inch coaxial cable running

from headend to headend with appropriately spaced amplifiers. If two-way capacity is needed, a single cable with bandwidth split in two directions is used, or two separate cables are laid with each carrying signals in the opposite direction. Again, one headend can serve as the master switching center, or a separate center can be established.

Coaxial cable is expensive to lay down and thus is not considered a cost-effective medium for interconnection except when relatively short distances are involved. (The "cutoff" point is somewhere between 5 and 10 miles.) Technical characteristics also limit cable to relatively short routes. A certain amount of distortion and degradation is typical as signals pass from amplifier to amplifier within a cable system. When signals have to pass through an interconnection link and then through cable system distribution, the potential for degradation is increased.

Cable over short routes can be economical when multiple channels are to be interconnected. And, as with microwave, cable can accommodate all kinds of one-way and two-way applications. Cable for interconnection does not require licensing or radio spectrum availability, although it does require permission to use rights-of-way.

Fiber optics cable is still being tested and is not frequently proposed for interconnection: however, it is likely to become increasingly important in the future. A cable system in Lompoc, California, is currently using optical fiber to send signals to its headend. The Lompoc experience provides evidence of fiber's potential effectiveness for cable system interconnection.

An optical fiber is a very thin glass fiber capable of transmitting signals at or close to the frequency of light. To create a fiber optics cable, glass fibers are encased in a protective sheath. The resulting cable is smaller and lighter than coaxial cable, approximately 1/4-inch in diameter. This size makes fiber cable particularly good for interconnection configurations that involve pulling the lines through existing ducts where larger cable will not fit.

In developing optical fibers, nearly all impurities in the glass are removed; resulting in fibers with very low transmission loss—5 to 10 decibels per kilometer as compared with 23 decibels per kilometer with one-inch cable. The fibers also have a very high bandwidth and thus are well suited to FM modulation techniques. Optical cable is not susceptible to electrical interference and is very difficult to tap illegally.

Because fiber optics cable is so new, it is not yet being manufactured on a large scale. Consequently, it is still relatively expensive. The basic ingredient—silicon—is both plentiful and inexpensive, however, and many analysts believe that this kind of cable has a great potential to become economical for cable interconnection and other uses in the future.

Costs of Interconnection

It is nearly impossible to specify typical costs for interconnection because there are so many variables in a given situation. Exhibit 11-1 con-

tains information on various interconnection options being considered in the Minneapolis-St. Paul metropolitan area and shows the relative cost differences among options for interconnecting a given set of cable systems.

Satellite Technology

Satellites are essentially communication relay stations in the sky. They sit in geostationary orbit, maintaining the same position relative to earth at all times, 22,300 miles above the equator. A microwave signal transmitted from the earth at one frequency is received by a piece of equipment on the satellite known as a transponder. From there it is retransmitted at a different frequency back to earth. To receive the signal, it is necessary to have an appropriately matched receiving dish aimed at the satellite. A signal may be sent via satellite from one point to another or from one point to many points simultaneously.

The high vantage point of a satellite gives it the capacity to send signals to any point in a wide geographic area with equal efficiency. (The area of coverage by a satellite is a kind of elliptical shape that has come to be called a "footprint.") It is a "mass medium" in scope and character. Therefore, a communication satellite could be used to interconnect widely dispersed cable systems; in fact, satellites have interconnected cable systems with national programming sources since 1975.

Satellite technology generally would not be selected for fairly localized interconnections (regional interconnects, for example) because of the high costs involved. During 1981, the going rate for leasing a transponder for one year was approximately $2.5 million. And, recent estimates are that a state-of-the-art satellite with 24 transponders would cost from $30 million to $36 million to construct and another $25 million to launch.[2]

Regulation of Interconnections

Perhaps the most challenging aspects of cable system interconnection are the regulatory questions. In the past, cable systems have been regulated at the Federal, State, and local levels. As cable technology has changed, new policy issues have surfaced and governments have struggled to cope with them. Because interconnections typically cross jurisdictional lines, they add still another layer of complexity to these policy questions.

To date, a limited number of regulations directly address or affect interconnection. At the municipal level, provisions dealing with easements and public rights-of-way would affect the laying of any wire technology incorporated into the interconnection. Likewise, microwave towers might be subject to local zoning laws, depending on their placement.

Franchising authorities are becoming sensitive to the need to address the question of interconnection, not an easy task. In drafting a request for

[2]Personal communication, Lou Bransford, vice president of planning and development, Public Service Satellite Consortium, Nov. 24, 1981.

proposals (RFP), a city is in a position to deal with only one component of an interconnection. Operators responding to an RFP are in a position to promise only what they individually are able to do. In the absence of State requirements for interconnection, cities and operators must rely on cooperation and coordination to see the interconnection concept implemented.

Some cities have begun including interconnection provisions in their franchise ordinances, particularly cities that have more than one cable company operating within their boundaries. Seattle, a city with five franchise districts, in a recent franchise award has required the franchisee to interconnect the access channel within 18 months after the award. Both Phoenix (another city with multiple systems) and Cincinnati have required their fran-

Exhibit 11-1
Comparison of Costs and Capacities, Minneapolis-St. Paul, Minnesota[1]

Mode	Capacity (Video Channels) From Interconnection Center	Capacity (Video Channels) To Interconnection Center
Single-channel microwave	5	4
Multichannel microwave	5	4
Coaxial cable supertrunk (separate cable for each headend)	14 (systems in 15-mile radius) 7 (systems outside 15-mile radius)	14 (systems inside 15-mile radius) 7 (systems outside 15-mile radius)
Coaxial cable supertrunk (shared cables for headends in 15-miles radius)	14 (shared) (systems in 15-mile radius) 7 (systems outside 15-mile radius)	14 (shared) (systems in 15-mile radius) 7 (systems outside 15-mile radius)
Coaxial cable supertrunk (shared cable for all headends, FM transmission)	7	7
Optical fiber supertrunk (separate cable for each headend)	12 (systems in 10-mile radius) 6 (systems outside 10-mile radius)	12 (systems in 10-mile radius) 6 (systems outside 10-mile radius)
Optical fiber supertrunk (shared cable for headend in 10-mile radius)	12 (systems in 10-mile radius) 6 (systems outside 10-mile radius)	6 (systems in 10-mile radius) 6 (systems outside 10-mile radius)

[1]From "Design of a Prototype Interconnection System "Prepared for the Minnesota Cable Communications Board,

chisees to interconnect at the request of the city.

At the State level, the subject of interconnection remains relatively untouched. As might be expected, States that have addressed interconnection are those that already play a strong role in cable regulation and development.

One of the strongest stances has been taken by Minnesota. In 1973, the Minnesota legislature created the Minnesota Cable Communications Board to oversee the development and regulation of cable. Within the enabling legislation were sections that called on the board to

> . . . prescribe standards for: franchises awarded in the twin cities metropolitan area which designates a uniform regional channel; the interconnection of all cable systems within this area; and the designa-

Capital Costs				
19 Cable Systems	14 Cable Systems (15-mile)	8 Cable Systems (10-mile)	Cost per Cable System	Costs per Cable System Channel
$1,420,000			$ 75,000	$ 8,300
$1,660,000			$ 87,000	$ 9,700
$3,134,000 (14 AM) (5 FM)	$1,512,000 (AM)	$605,000 (AM)	$ 76,000 (0-10 miles) $151,000 (10-15 miles) $324,000 (above 15 miles)	$ 2,700 (0-10 miles) $ 5,400 (10-15 miles) $23,100 (above 15 miles)
$2,460,000 (14 AM) (5 FM)	$ 847,000 (AM, shared)	$605,000 (AM)	$ 76,000 (0-10 miles) $141,000 (10-15 miles) $323,000 (above 15 miles)	$ 2,700 (0-10 miles) $ 5,000 (10-15 miles) $23,000 (above 15 miles)
$2,941,000 (FM)			$155,000	$11,100
$6,240,000 (11 digital)		$750,000	$ 94,000 (within 10-miles) $500,000 (outside 10-miles)	$ 3,900 (within 10-miles) $41,700 (outside 10-miles)
$6,240,000 (11 digital)		$510,000 (analog)	$ 64,000 (within 10-miles) $500,000 (outside 10-miles)	$ 3,500 (within 10-miles) $41,700 (outside 10-miles)

St. Paul, Minnesota, by Telecommunications Management Corp., Los Angeles, March 1980.

tion of a single entity to schedule programs and facilitate use of this channel;

. . . designate the entity referred to in clause (c) and prescribe rules for its operation and practice which rules shall insure that priority is given to public use of the uniform regional channel." (*Minn. Stat.* Chapter 238.05, subd. 2(c & d))

. . . Subd. 12. The board shall prescribe standards for interconnection and compatibility of cable communications systems. *(Minn. Stat.* Chapter 238.05, subd. 12)

A set of administrative rules for cable systems later evolved that addressed interconnection more comprehensively. These stated a requirement that all cable systems within the 7-county metropolitan area of Minneapolis-St. Paul must interconnect on standard VHF channel 6 to create a uniform "regional channel." The rules further required the board to designate a regional channel "entity" to schedule the programming and facilitate use of the channel. They also specified technical standards for interconnection within the State.

As this chapter was being written, the Minnesota Cable Communications Board was in the process of implementing the interconnection requirements. Many policy questions were being discussed, including the potential uses of the regional channel, who should be designated as the regional channel entity, procedures for interconnection, access to the interconnection system, and financing and management questions.

A similar plan is evolving in Rhode Island. In January 1981 the Division of Public Utilities and Carriers of the Public Utilities Commission adopted rules governing cable communications systems that included a section on interconnection of systems. This section required that:

- All systems to be designed and constructed so they are capable of interconnecting with adjacent systems.
- Within 18 months after two or more systems receive authorization from the State to operate they should interconnect and begin providing programming. Other systems are also required to do the same within 18 months after certification.
- The statewide interconnection should be capable of both upstream and downstream signals and at least two upstream and two downstream channels should be interconnected.
- Operators are required to pay a proportionate share of establishing and running the interconnection.

Like Minnesota, Rhode Island envisions that some kind of entity will have to be set up to oversee the use of the interconnect; however, the administrative details had not been worked out as of this writing.

Two other States that have addressed interconnection are New York and Massachusetts. In the enabling legislation that created the New York State Commission on Cable Television there are provisions that require systems to be technically capable of interconnecting and that give the com-

mission authority to order interconnection whenever it finds it to be in the public interest. Thus far, the commission has not ordered interconnection. Agency staff have compiled a statewide inventory of microwave and satellite facilities that might be used for interconnection and have included interconnection as a goal in the statewide development plan.

Massachusetts' cable regulations make no mention of interconnection, but the Massachusetts Cable Commission is beginning to study the subject for informational purposes. They see their ongoing role as one of facilitating interconnection. To date, they have no plans to promulgate interconnection regulations of any kind.

A final State that has taken some initiative with interconnection is New Jersey. Intrigued with the potential of statewide interconnection for public service uses of cable, the Office of Cable Television in the Board of Public Utilities began feasibility studies of statewide interconnection in 1979. The agency foresaw that the State's community colleges might be able to deliver educational programming over such a system. It hoped to play a key role in the development and management of the interconnect.

Agency representatives went ahead and obtained the necessary microwave licenses but were unable to proceed further. The Treasury Department of the State of New Jersey raised questions about the legality of the State becoming involved in an interconnection scheme. On February 19, 1980, the State Attorney General's office issued an opinion that stated that the Office of Cable Television could not be involved in the construction, supervision, or maintenance of an interconnection or use State assessments (a fee paid to the State by cable companies) for interconnection. The attorney general found that it was beyond the scope of the agency's jurisdiction to play such an active role.

The Office of Cable Television has since turned over its microwave licenses to industry representatives and is encouraging companies to make public interest programming a priority in any interconnection that is developed. This experience suggests that regulatory agencies in other States should think carefully about the ways in which they become involved with interconnection.

At the Federal level, interconnection is currently affected through the licensing of microwave and satellite frequencies. Beyond that, the FCC has developed no policies but rather is adopting a "wait and see" attitude. Similarly, Congress has not become involved in interconnection issues.

There is some potential for additional regulatory activity at both the State and Federal levels. Relatively few of a system's total channels are likely to be interconnected in any given situation. Thus, a scarce resource (regional channels) is being created within a technology of supposed "nonscarcity." Because the demand for regional channels could be great, questions about access to those channels and priority uses may be raised. Scarcity traditionally has been used as a rationale to regulate broadcasting.

Similarly, interconnections may take on certain monopolistic

characteristics. The availability of microwave frequencies and other technical considerations may make it difficult for more than one interconnection scheme to be developed for a given set of systems. This may put interconnected channels in the hands of a single entity, with little chance for competition.

The lack of competition could become a critical issue if fees become associated with interconnection. At present, interconnections have not involved charges for channel time. As the applications expand, however, and as common carrier or lease schemes are initiated, questions are likely to be raised about rate regulation.

It is important to note here that when systems are interconnected, an entirely new communications avenue is created—one that does not fit neatly within traditional boundaries. Up until now, governments at the State, local, and Federal levels have each claimed a role in overseeing cable. But interconnected systems straddle the lines between each level of government, making a regional body of some kind seem a more likely choice. Such bodies do not now exist, and whether it is possible or advisable to create a fourth tier of regulation in an era of deregulation is a topic for considerable thought and discussion.

Existing Interconnections

The potential of cable system interconnection is being recognized by many cable operators nationwide. At the end of 1981, the National Cable Television Association had documented some twenty interconnections that were either established or being planned (see Exhibit 11-2). Following is an overview of some of the more extensive interconnections currently in place.

San Jose, California

One of the earliest and largest interconnects was initiated by Gill Cable in San Jose, California. To attract new advertising revenue, Gill began offering its local origination sports channel via a single-channel FM microwave and wire interconnect to nearby systems in 1979. The company has covered the bulk of the costs of the hardware, although some of the participating systems have paid for some portions. Gill is acting as the manager for the interconnect and, by agreement, is collecting the advertising revenues that accrue until the initial investment is amortized. At that point, all systems will share the revenues according to their number of subscribers.

At present, two channels are interconnected, with one offering the Cable News Network (CNN) and the other the Entertainment and Sports Programming Network (ESPN) along with some local sports. A total of 34 systems and 776,500 subscribers are now involved.

Connecticut

A parallel kind of interconnect is developing in the State of Connecticut. In this case, however, it has come about through the mutual efforts of

companies belonging to the Connecticut Cable Television Association. Since July 1981, eight systems have been linked and have been sharing CNN and ESPN. The primary goal was the opportunity to attract advertisers and generate new revenues. Systems are splitting the revenues based on their number of subscribers.

This interconnect is using existing technology that put in place relay broadcasting signals around the State. It consists of both coaxial cable links and multichannel microwave links, some of which are two-way. Additional connections were added so that the two satellite programming services are

Exhibit 11-2
Cable Interconnect Systems

Name	Location	Subscribers	Systems
Operational			
Gillcable Bay Interconnect	San Francisco San Jose area	776,500[1]	34
Cable Networks, Inc.	New York City metro area	631,000	4
Connecticut Interconnect	Hartford/New Haven	350,000	7
Cox Cable	San Diego	325,000	3
International Cable	Buffalo/Rochester	200,000	4
Central New York Interconnect	Upstate New York	180,000	6
Cable Advertising Network	Seattle/Portland/Tacoma/ Spokane	165,000	4
Coachella Valley	Palm Springs area, CA	62,000	2
Heritage Cable	Iowa	60,000	7
Hawaiian Interconnect	Hilo	10,000	2
Planned			
New Jersey Cable TV Association	New Jersey	700,000	53
Philadelphia Interconnect	So. New Jersey, Pennsylvania, & Delaware	350,000	29
Boston Interconnect	Boston	185,000	5
Tele-Communications	Pittsburgh metro area	140,000	9
Atlanta Interconnect	Atlanta	100,000	2
Chicago Interconnect	Chicago	44,000	4
Florida Gulf	Naples/Fort Meyers, FL	28,000	n.a.
Warner Amex Cable	Ohio	n.a.	n.a.
Shelby	Shelby, KY	n.a.	n.a.
Southeastern Florida	Miami/Fort Lauderdale	n.a.	n.a.

Source: The National Cable Television Association, November 1981
[1]Total includes subscriber counts on all channels in system.

received at a system in Seymour with a 6-meter dish. From there, signals are transported to Hartford, New Haven, and Bridgeport.

The trade association hopes to connect all 21 systems in the State as well as add several more channels. The group envisions that at least one of the new interconnected channels will be used for a public service application, such as statewide distribution of sessions of the Connecticut legislature. Although the project is still young, the returns are already becoming clear. Over a period of three months, approximately $100,000 was generated from advertising—about the same amount that was spent on the interconnection links.

Iowa

A mixture of entertainment and public interest services are being provided over 35 interconnected systems in Iowa. All of the interconnected systems are owned by Heritage Communications, Inc. Their incentive was to make maximum use of existing single-channel FM microwave equipment.

Some satellite programming, State sporting events, and other local origination programs are distributed via the interconnect. About half of the 500 path-miles have two-way capability, so it has been possible to do teleconferencing over the system. Public service users have included Iowa State University and the State Department of Transportation. The value of the microwave technology is approximately $1 million.

Pennsylvania

Probably the most extensive interconnect in the country conceived for noncommercial applications is being built in Pennsylvania. The result of a creative partnership between Pennsylvania cable operators and Pennsylvania State University, the project's main objective is to make continuing education available to citizens throughout the State.

According to an agreement signed in 1979, cable operators are underwriting the costs of building and maintaining a statewide microwave interconnection system. The hardware is owned by a nonprofit corporation—the Pennsylvania Educational Communications Consortium (PECS)—formed by the cable companies. As its contribution, Penn State is developing programming and coordinating use of the system.

During the first two years after the agreement was signed, systems were joined together from the center of the State stretching eastward. A single video channel offered programming to about 150,000 subscribers, although the system is capable of delivering up to four channels. By 1983, the remainder of the interconnect will be built, completing a kind of "figure 8" pattern across the State. The interconnect is eventually expected to reach some 600,000 households.

Most of the material disseminated thus far has been for-credit and continuing education courses produced by Penn State. However, other users, including educational institutions, government agencies, a hospital council, and the State Bar Association have also used the channel. Initially,

Penn State's programming was financed with a telecommunications grant from the U.S. Department of Health, Education, and Welfare (HEW). Now that this money has been exhausted, the university is shifting to a fee-based budget ($110 per course or activity) that will allow the effort to become self-sustaining. (See chapter 8 for more information on this interconnection.)

Columbus, Ohio

Columbus, Ohio, has four different companies operating within its boundaries. A single-channel microwave system is currently being used to interconnect a joint government/public access channel. This system has allowed the local government to distribute safety information and energy tips citywide.

Columbus officials have been interested in developing an institutional loop and a traffic control system that will make use of cable. As a result, they are planning to build a more comprehensive wire interconnection. They estimate that the bulk of the interconnect will be accomplished with 400 MHz coaxial cable with two-way capacity, although fiber optics cable is being considered for the downtown area.

Unlike the other interconnections described, the Columbus effort will not involve industry financing. The city has applied for a National Telecommunications and Information Agency grant of approximately $685,000 to finance the system. It plans to operate the interconnect and possibly lease channel space to the cable companies to cover ongoing costs.

Chicago, Illinois

An interconnect is currently in the planning stages for the Chicago area initiated by Centel Videopath, Inc., a subsidiary of Centel Communications. The immediate goal is to link ten major companies operating in the area, later expanding throughout the Chicago area once the area is completely wired for cable. The primary interconnection technology will be microwave, but a satellite uplink will also be included to allow for video teleconferencing.

One of the most interesting aspects of this new interconnect is that Centel plans to operate it as a common carrier. Users of the system will pay fees to use time on the channels. This practice will enable the company to recoup its approximately $3 million in construction costs.

Other more limited interconnections are sprinkled throughout the country. These include efforts in East Lansing, Michigan; Seattle, Washington; Buffalo, New York; Syracuse, New York; and in the Boston, Massachusetts, area. As more systems are franchised and built during the rest of the decade, many more interconnections will be established.

Summary

Although the future of interconnections seems promising, an array of questions have yet to be fully addressed. Depending on how they are

resolved, interconnections could spread widely or develop more sporadically.

Some of the larger questions have already been suggested, such as those related to access, control, ownership, and regulation. But others are equally significant. For example, because of the state of the economy, most interconnections will be financed privately rather than publicly. If companies foot the bill, can they or should they be required to provide for public service users? And to what extent can the industry be expected to subsidize institutions, agencies, and governments that wish to use interconnected channels but cannot contribute to hardware costs?

Still another important issue is whether interconnection can proceed at a scale that may be desirable. Many systems in the country still have limited channel capacity, and such systems may not be able to make bandwidth available for interconnection even if they want to. Smaller systems may not be able to afford the costs of interconnection technology and so may be left out of interconnection schemes. Finally, interconnection may be slowed because of various tiering and rate schemes being used. Channels may be available on different tiers in different systems, so efforts to share services may prove to be awkward.

Appendix 1

Elements Of Community Television Production

By

John Velie

Appendix 1: Elements of Community Television Production

The Basic Forms of Community Television Programming

Live Studio Production

This is the most common form of programming produced by community television operations. In this form, all action takes place within a studio setting. The program is produced "live"—whatever the cameras pick up, the viewers at home see. Nothing is edited. These are the easiest types of programs to produce because the production variables (lighting, ambient sound, etc.) are tightly controlled. The minimum personnel required for producing a live studio cablecast includes an overall producer in charge, talent (the people being interviewed, etc.), two to three camera operators, a director/switcher, and someone to monitor sound. The equipment needed for live studio production is discussed later.

Taped Studio Production

This form is the same as the live studio production except that the action is videotaped and edited before it reaches the home viewer.

Remote Live Production

This form of programming covers some kind of event, such as a football game or city council hearing. In many ways, a remote live production is similar to the studio live production with one major difference—the production staff and equipment go to the action. The equipment needed for remote live production is a portable multicamera system. The minimum personnel include those required for live studio productions with the addition of a lighting technician and various helpers to carry equipment. The logistics of producing this type of program make remote live productions difficult.

Remote Taped Production

Similar to remote live productions with the exception that the action is videotaped and edited for errors before it is cablecast.

Documentary Production

This programming is the most sophisticated and time-consuming form of community television. It requires access to single-system production, editing, and postproduction hardware. The primary personnel involved include the producer in charge, a camera operator, a sound technician, and an editor.

Taped Insert Production

Taped inserts are pieces of prerecorded video that are inserted into a live or taped studio production. The equipment and personnel necessary for taped insert production is the same as required for documentary production.

Alphanumeric Production

Alphanumeric production involves print or text only information. Community bulletin board channels are an example of alphanumeric production. The only personnel required in the simplest example is one person to type the messages into the alphanumeric hardware.

Basics of Production Equipment

In video, "quality" refers to the users the equipment manufacturer had in mind when designing the hardware. There is **consumer** quality equipment, **industrial** quality equipment, and **broadcast** quality equipment.

Consumer quality equipment, the most inexpensive of the three, is designed for the average person. It is relatively simple to operate, can be purchased at most department stores and can produce images and sounds equal or superior to highly sophisticated super-8 film systems.

Community television operations with small budgets should seriously consider purchas-

ing consumer quality equipment because television produced using consumer quality equipment can be cablecast. Although it is true that the signal quality of consumer equipment is inferior to that of industrial and broadcast equipment, by taking care during actual production it is possible to maintain technical standards equal to or greater than those necessary for cable television distribution.

Industrial quality equipment is designed for large institutional users such as universities, hospitals, and large corporations. Although the technical standards and specifications nearly match those of broadcast quality equipment, the cost is usually one-half to two-thirds that of broadcast equipment. Most cable-company-owned and operated community television operations are equipped with industrial quality equipment.

Broadcast quality equipment is designed for network-level broadcast television. It is the top of the line, and the costs of acquiring broadcast quality equipment are usually prohibitive for most community television operations. To illustrate the differences in cost between the three types, consider the cost of purchasing a portable camera. Consumer quality cameras range in cost from $700 to $2,000. Industrial cameras range from $5,000 to $18,000, and broadcast cameras can go as high as $50,000.

The second major factor governing the cost and performance of video equipment is tape format. Format refers to both the recording process (i.e., VHS or Beta) and to the actual width of the videotape the equipment uses. Generally, the wider the tape width, the higher quality the signal. One-half-inch cassette formats are widely available home formats (VHS and Beta) that are relatively inexpensive and easy to use. Three-quarter-inch video production equipment is slightly more professional, with more options available, especially in postproduction (editing) equipment. The different video formats include the following:

- ¼-inch cassette. This format is consumer quality and has been adopted by only a few manufacturers. As such, highly incompatible videotapes shot using one manufacturer's ¼-inch equipment cannot be played back on another manufacturer's equipment and should probably be avoided.
- ½-inch open reel. This is the original small format video introduced in the late 1960's. It is obsolete and should be avoided.
- ½-inch VHS cassette. This format is high-quality consumer equipment. Portable recording decks are inexpensive and in general home use. Editing equipment is not widely available in this format.
- ½-inch Beta cassette. This format is also high-quality consumer equipment. However, VHS and Beta are not compatible.
- ¾-inch EIAJ standard cassette. This is the standard format used in the cable and broadcast television industries. It produces high-quality videotapes and generally is widely available in schools, industry, and commercial studios.
- 1-inch and 2-inch. These formats are the highest technical quality formats. They are used by many broadcast television operations and are for the most part prohibitively expensive to the average community television operation.

Format is a confusing topic because there are so many different types. In general, there are two rules of thumb concerning format. First the smaller the format, the lower the cost and the quality of the equipment (i.e., ½-inch compared to ¾-inch). Second, before purchasing equipment, the buyer should make sure the format of the equipment being bought is compatible with the equipment already owned.

Equipment Configurations and Costs

Category 1: Field Production

This category of equipment includes pieces of hardware used for recording images and sounds in remote locations. Field production equipment must be portable, lightweight, easy to carry, and durable. Two field production systems are outlined here: single camera (used for news gathering and documentary style shooting) and multicamera (used for taping events such as football games or city council meetings).

Single-Camera System

Configuration: 1 camera, 1 video-recorder, 1 lighting kit, 1-4 batteries, 1-4 microphones, 1 tripod.

Cost Range: (Based on a mix of consumer and industrial quality equipment)
½-format—$2,100–$7,000
¾-format—$9,200–$25,000

Production Van: **Multicamera System**

Configuration: 3 cameras with studio viewfinders, 3 tripods with fluid heads, 1 portable switcher, lighting system, signal processing (time base corrector, etc.), character generator, microphones, audio mixing board, headsets with internal communication, audio and video cables, video power supplies, and video recorder.

Cost Range:* (does not include truck or equipment racks) (Based on a mix of industrial, 3/4-inch equipment)
$45,000-$107,000

**Note: ½-inch recording equipment could be substituted here; however, the savings would be negligible.*

Category 2: Studio Equipment

This category of equipment includes pieces of hardware used in fixed-location (studio) productions. All of the equipment listed in the preceding multicamera field production system can double as studio hardware. Therefore, this section lists only additional pieces of hardware used in studio production.

Configuration: Multicamera system; additional audio components including turntable, audio deck, speakers, telephone interface (for live call-in shows) equalizer and studio-quality microphones, overhead lighting grid, cyclorama (curtains), sets, additional signal processing equipment, and telecine (multiplexer, a machine that allows film to be converted to video).

Cost Range: $50,000-$150,000

Category 3: Editing

This type of editing arrangement is becoming the standard for community television operations because it significantly reduced expenditures for videotape stock. A ½-inch video cassette costs approximately one-third to one-half of the cost charged for ¾-inch video cassettes. By shooting on ½-inch cassette and editing up to ¾-inch, the community television producer lowers production costs while maintaining signal quality.

½-inch to ¾-inch Editing System

Configuration: Allows material shot on ½-inch production equipment to be edited into ¾-inch videotapes. Includes ½-inch video editing deck, ¾-inch editing deck, and editing controller and two color monitors.

Cost Range: $11,000–$13,500

¾-inch to ¾-inch Editing System

Configuration: Playback video editing deck, recording video editing deck, edit controller, and two monitors. This system insures high technical quality.

Cost Range: $16,000–$20,000

Category 4: Postproduction Equipment

Postproduction equipment is essentially advanced editing hardware. It incorporates basic editing equipment and embellishes on it. Postproduction capability allows functions such as dissolving between scenes, putting titles on programs, and adding special effects like color keys and mattes. Postproduction equipment is similar to studio control room equipment.

¾-inch to ¾-inch System

Configuration: 1 or 2 video playback decks, an editing controller, a special effects generator, signal processing equipment (time base corrector, vektorscope, etc.), turntable, audio decks, audio mixer, audio equalizer, a video recording deck, multiple monitors, character generator, and racks to hold equipment.

Cost Range: $50,000–$250,000

Category 5: Alphanumeric Equipment

Alphanumeric equipment is used to produce "text-only" programming. For example, this equipment makes programming a community bulletin board channel possible.

Configuration: A keyboard, storage device, CRT (specialized TV monitor), and modulator.

Cost Range: Approximately $9,000 (does not include the cost of modulators or computing, switching, or routing equipment needed at the system headend).

Appendix 2

Satellite Program Services

The Cable Television Information Center

Appendix 2: Satellite Program Services

Note: Rates are listed on per-subscriber, per-month basis unless otherwise noted.

Current Basic Services

Alpha Repertory TV Service (ARTS): Cultural service of performing and visual arts distributed by ABC Video Enterprises/Warner-Amex Satellite Entertainment. Advertiser underwritten. Shares Satcom III, transponder (tr.) 1 with Warner's Nickelodeon service. 9 p.m. to midnight nightly. Free to operator with Nickelodeon (10 cents) Warner-Amex Satellite Entertainment Corp., 1211 Avenue of the Americas, 15th Floor, New York, NY 10036. (212) 944-4223.

American Educational TV Network (AETN): Continuing education and governmental training programs. 4 to 7 p.m. Mon.-Sat.; 4 to 6 p.m. Sun. Free to operator. Satcom III, tr. 16. 2172 Dupont Drive, Irvine, CA 92715. (800) 854-7387.

AP News Cable: Alphanumeric world, sports, business, and farm news crawl. 24 hours daily. Charge varies with number of subscribers. Westar III. 50 Rockefeller Plaza, New York, NY 10020. (212) 621-1500.

Appalachian Community Service Network (ACSN): Educational and public affairs programming, teleconferencing distributed by Appalachian Regional Commission. Noncommercial. 7 a.m. to 5 p.m. Mon./Wed./Fri.; 7 a.m. to 7 p.m. Tues./Thurs.; 7 a.m. to noon Sat./Sun. Operator pays 1 cent for single systems, ½ cent for multiple systems. Satcom III, tr. 16. 1200 New Hampshire Ave., Suite 240, Washington, DC 20036. (202) 331-8100.

Black Entertainment Television (BET): Black entertainment, music, sports, and movies. 11 p.m. to 2 a.m. Fridays. Advertiser supported, operator pays 1 cent per black subscriber in top 100 markets. Satcom III, tr. 9. 3222 N Street, N.W., Washington, DC 20007. (202) 337-5260.

Cable News Network (CNN): 24-hour news coverage distributed by Turner Broadcasting System. Advertiser supported. Price to operator is 15 cents with WTBS, 20 cents without. Satcom III, tr. 14. 1050 Techwood Drive, NW, Atlanta, GA 30318. (404) 898-8500.

Cable News Network (CNN) II: Continuously updated 30-minute wheels of hard news with 5 minutes reserved for local news. Distributed by Turner Broadcasting System. Free with CNN; 5 cents without. Satcom III, tr. 15. (See CNN.)

Cable Satellite Public Affairs Network (C-SPAN): Coverage of U.S. House of Representatives proceedings, National Press Club Luncheons, and other governmental topics. 9 a.m. to 1 a.m. daily. Underwritten, free to operator. Satcom III, tr. 19. 400 N. Capitol Street, N.W. Suite 155, Washington, DC 20001. (202) 737-3220.

Cabletext: 24-hour newswire service—Reuters, UPI, Vector distributed by Southern Satellite Services. Noncommercial. (See SSS.)

Calliope: Children's movies. 6:30 to 7:30 p.m. weeknights, Sat. mornings. Advertiser supported. Distributed by USA Network. (See USA.)

CBS Cable: Cultural programming concentrating on performing arts, with stereo simulcast. 60 percent of programming to be produced in-house by CBS, Inc. Advertiser supported. 7 to 10 p.m. daily. Free to operator if offered on basic tier; 15 cents if placed on expanded basic tier. Westar III, tr. 6. 51 West 52nd Street, New York, NY 10019. (212) 975-1770.

Christian Broadcasting Network (CBN): 24-hour Christian-oriented programming presented in varied formats, distributed by CBN. Advertiser supported. Free to operator. Satcom III, tr. 8. CBN Center, Virginia Beach, VA 23463. (804) 424-7777.

Christian Media Network (CMN): Nightly Christian and family programming. Drama, music, movies, talk, entertainment. 7 p.m. to 2 a.m. Mon. through Sat., 9 p.m. to 2 a.m. Sun. Satcom I, tr. 16. P.O. Box 20121, Bloomington, MN 55420 (Lost satellite space; stopped operations February 1982.) (612) 884-4540.

Daytime (BETA): Women's programming (soap operas, talk shows). Mon. through Fri., 1 to 5 p.m. Advertiser supported, free to operator. Satcom III, tr. 22. Begins March 15, 1982. Distributed by Hearst/ABC Video Services, 959 8th Avenue, New York, NY 10019. (212) 262-7628.

Dow-Jones Cable News: 15-minute alphanumeric cycle of stock and financial news, *Wall Street Journal* and *Barron's* articles. 24 hours daily. Satcom III, tr. 3. P.O. Box 300, Princeton, NJ 08540. (609) 452-2000, x2680.

English Channel: Drama, entertainment, documentaries, and music from Great Britain's Granada and Yorkshire television networks. Advertiser supported. 2 hours/night, Sun./Tues./Wed.; 4 hours, Sat. afternoon. Distributed as part of USA Cable Network. (See USA.)

Entertainment and Sports Programming Network (ESPN): 24-hour sports network including professional, amateur, and NCAA events. Advertiser supported. Operator receives rebate when service is placed on lowest tier or on expanded basic having 90 percent of subscribers. Satcom III, tr. 7. ESPN Plaza, Bristol, CT 06010. (203) 584-8477.

Episcopal Television Network: Religious programming, 6 to 8 p.m. Sun. Satcom III, tr. 16. Box 2060, New York, NY 10163. (212) 888-1862.

Eternal Word TV Network (EWN): Catholic programming, 7 to 11 p.m. daily. Free to operator; supported by grants and donations, no advertising. Westar III, tr. 12. 5817 Old Leeds Road, Birmingham, AL 35210. (205) 956-9537.

Madison Square Garden Sports (MSG): NBA basketball, boxing, tennis, track meets, and other sports events. Four hours per night. Advertiser supported. Distibuted as part of USA Cable Network. (See USA)

Modern Satellite Network (MSN): Home Shopping Show and informational programming designed as alternative daytime fare. Distributed by Modern Talking Picture Service. 10 am-1 pm. Advertiser supported, free to operator. Satcom III, tr. 22. 45 Rockefeller Plaza, New York, NY 10011. (212) 582-5500.

Music Television (MTV): 24-hour rock music service simulcast in Dolby stereo. Features video promotions of records, music, news. Advertiser supported, free to operator. Satcom III, tr. 11. 1211 Avenue of the Americas, New York, NY 10036. (212) 944-4250.

National Christian Network (NCN): Multi-denominational religious programming, 24 hours daily. Noncommercial, free to operator. Comstar D2, tr. 4V. Box 493, Cocoa, FL 39222. (305) 632-1510.

National Jewish Television (NJT): Current affairs, entertainment, and religious programming of interest to Jewish viewers. Noon–4 pm Sun. Advertiser supported, free to operators. Satcom III, tr. 16. 2621 Palisades Avenue, Riverdale, NY 10463. (212) 549-4160.

Nickelodeon: Children's programming channel featuring series designed for specific age groups through teen years. Distributed with ARTS by Warner-Amex Satellite Entertainment Corp. 8 am–9 pm daily. Noncommercial, operator pays .10. (See ARTS)

North American Newstime: Previously called UPI Newstime, now includes the Women's Channel. 24-hour color slo-scan of news, business and sports. Distributed by Eastern Broadcast Services. Advertiser supported, operator pays .05. Satcom III, tr. 6. 1800 Peachtree Road, Atlanta, GA 30309. (404) 351-9103.

PTL Television Network: 24-hour religious, family, and children's programming. Noncommercial, free to operator. Satcom III, tr. 2. 7224 Park Road, Charlotte, NC 28279. (704) 732-8509.

Reuters Monitor: Encoded text-retrieval news service. 3 am–3 pm daily. No advertising. Satcom IIIR, tr. 18. 1212 Avenue of the Americas, New York, NY 10036. (212) 732-8509.

Reuters Newsview: 24-hour news, financial, and sports crawl. No advertising. Price to operator not available. Satcom III, tr. 18. (212) 732-8509. (See Reuters Monitor)

Satellite Program Network (SPN): Network of programs including Telefrance USA and Studio I (Italian programming), with intention to emphasize women's programming. 24

hours daily. Advertiser supported, free to operator. Westar III, tr. 9. Distributed by Southern Satellite Systems. (See SSS)

Shopping Channel: Subscribers pay $18 annual membership fee, allowing purchasing and discounts from video "catalog." (See MSN.)

Southern Satellite Service (SSS): Distributes WTBS, North American Newstime/The Womens' Channel, Cabletext (Satcom III, tr. 6) and SPN (Westar III, tr. 9). Box 45684, Tulsa, OK 74175. (918) 481-0881.

Spanish International Network (SIN): Spanish-language movies, sports, comedy, and news. Plans to carry programming from Mexico and Spain. 24 hours daily. Advertiser supported, operator receives 10 cents per Hispanic subscriber. Westar III, tr. 8; Comstar D-2, tr. 4H. 250 Park Avenue, New York, NY 10177. (212) 953-7507.

Studio I: Italian cultural and popular programming, distributed as part of SPN. 6 hours per week. (212) 355-0124.

Trinity Broadcasting Network (TBN): Christian variety programming representing 14 denominations. 24 hours daily. TBN has access to transportable earth stations. Noncommercial, free to operator. Comstar D2, tr. 9V. P.O. Box A, Santa Ana, CA 92711. (714) 832-2950.

USA Cable Network: 24-hour network of professional and collegiate sports, children's and cultural programming. Includes MSG, Calliope, English Channel, Alive & Well, YOU, Better Homes & Gardens, Night Flight (rock music). Distributed by UA-Columbia Satellite Services, Inc. Advertiser supported, operator pays 11 cents. Satcom III, tr. 9. 208 Harristown Road, Glen Rock, NJ 07452. (201) 445-8550.

Video Concert Hall: Top-40 video music program. 11:30 p.m. to 1 a.m. nightly. Advertiser supported, free to operator. Satcom III, tr. 16. Atlanta, GA. (404) 892-7377.

Window on Wall Street: Business and financial programming distributed by Chesney Communications. 3 hours per week. Hollywood, CA. (213) 469-2664.

Women's Channel: Color slo-scan news, book reviews, and commentary of interest to women. Previously distributed by Southern Satellite Systems, now part of North American Newstime.

Future Basic Services

American Network: In-room movie/teleconference service to hotels and motels. $2 per movie; conferences individually priced. Movies 5 p.m. to 5 a.m. (ET) daily; teleconferences as scheduled. Guest supported. Comstar D1. 2049 Century Park East, Suite 1615, Los Angeles, CA 20067. (212) 553-8254.

Billy Batts: Variety programming from Kentucky. Satcom IV, tr. 3. Expected late 1982.

Black Music TV: No information. Satcom IV, tr. 16. Expected July 1982.

Cable Health Network: Health-related topics including nutrition, exercise, diet, and family health. 24 hours daily. Advertiser supported. Expected May 1982. Distributed by Reiss Video Associates, 888 7th Ave., 28th Floor, New York, NY 10016. (212) 246-6340.

Catholic Telecommunications Network of America: Appeal programs, documentaries, G-rated features, travel log, talk show, and news formats. Expected September 1982. 5 hours/day, 5 days/week. Price to operator, satellite, and transponder number not available. 95 Madison Ave., Suite 804, New York, NY 10016. (212) 696-0800.

Chromatic Animation Network (CAN): Feature films, history of animation. Free to operator, advertiser supported. Expected in fall 1982. Chromatic Communications, 1619 Broadway, Room 917, New York, NY 10019. (212) 581-2660.

Comsat Network: No information available. Westar III, tr. 7. Expected late 1982.

Heartbeat Media Network: Contemporary music for the 18-40 audience. 7 p.m. to 1 a.m. daily. Westar III. 1760 Broadway, 11th Floor, New York, NY 10019. (212) 582-9552.

Home Music Store: Music preview and taping service using digital signals. 24 hours daily. Westar IV, tr. 22. Expected June 1982.

Nashville Network: Country music and entertainment 12 hours daily. Advertiser supported, free to operator. Expected March 1983. Westar IV. Joint venture of Opryland Productions and Group W Satellite Communications. Opryland Productions, 2806 Opryland Drive, Nashville, TN 37214. (615) 889-6840.

New Prime Time: Variety programming of appeal to viewers 45 years of age and older. Distributed to Cinemerica. 24 hours daily. Advertiser supported, free to operator. Expected summer 1982. Comstar D2, tr. 10. 155 N. LaPeer Drive, Suite 105, Los Angeles, CA 90048. (213) 550-1563.

Satellite News Channels I & II: 24-hour news services to be distributed by ABC/Group W Video Enterprises. Advertiser supported, free to operator. Westar IV.Expected July 1982. 4 Harbour Plaza Drive, P.O. Box 10210, Stamford, CT 06904. (800) 243-9140.

Satellite News 1: National, State, and local news headlines updated constantly.

Satellite News 2: In-depth analysis of national, State, and local news.

Southern Video Network: Regional and intercollegiate sports and entertainment specials. Satcom I, tr. 7. (813) 689-7194.

Univision: International specials produced by SIN approximately four times per year. Westar III, tr. 15. Expected in May 1982. (See SIN.)

US Senate/C-Span: Coverage of all Senate Chamber proceedings, repeated in evenings. 3 cents per subscriber, no advertisements. Expected fall 1982. Satcom IIIR, tr. 19. (See C-SPAN.)

UTV Cable: Emphasis on viewer involvement with a variety of sports, talk, how-to, and other programming. Distributed by Ultimedia. 3 p.m. to 3 a.m. daily. Satcom IV, tr. 23. Expected May 1982. 2208 Route 208, P.O. Box 487, Fairlawn, NJ 07410. (201) 794-3660.

Video Music Channel: Audio/video music programming. (317) 253-2574.

WBLS Cable (The World's Best Looking Sound): Music and lifestyle interviews with black performers. Free to operator. Noon to 1 a.m. daily. Satellite, transponder, and availability data not available. 801 Second Avenue, New York, NY 10017. (212) 697-9210.

The Weather Channel: 24-hour national, regional, and local weather forecasting. Expected May 1982. Satcom I, tr. 21. 2625 Cumberland Pkwy., Suite 450, Atlanta GA 30339. (404) 434-6800.

Current Premium Services

Bravo: Film, dance, music, and other cultural programming. 8 p.m. to 6 a.m. daily. Operator pays $3.20 per subscriber, discounts for volume. Comstar D2, tr. 4V. Distributed by Rainbow Programming Service, 100 Crossways Park West, Suite 200, Woodbury, NY 11797. (516) 364-2222.

Cinemax: 24-hour all-movie channel designed to complement HBO in multipay markets. Distributed by HBO, Inc. Operator pays $3.20 plus 35 percent of any charge over $7. Satcom III, tr. 20, 23; Comstar D2, tr. 7V. (See HBO.)

Escapade/Playboy: Features R-rated films and adult-oriented action/adventure specials. Distributed by Rainbow Programming Service. Comstar D2, tr. 4V. (See Bravo.)

Front Row: G and PG family programming taken from total Showtime package. Approximately 2 hours per night. Subscriber rate approximately $4.50. (See Showtime.)

Galavision: Programming designed to appeal to Hispanic audience. 65 percent motion picture, 25 percent "novellas," 5 percent sports, remainder variety. Distributed by SIN. 8 p.m. to 4 a.m. Mon. through Fri.; 3 p.m. to 4 a.m. Sat.; 1:30 p.m. to 4 a.m. Sun. Operator pays 50 percent of subscriber rate, approximately $4 per month. Satcom III, tr. 18. (212) 953-7550. (See SIN.)

Home Box Office (HBO): Entertainment channel concentrating on motion pictures, with some concerts, sports events, and specials. 5 p.m. to 2 a.m. weekdays, 2:30 p.m. to 3 a.m. weekends. Operator pays approximately half of subscriber fee, about $3.85. Satcom III, tr. 20, 24; Comstar D2, 9H. Time-Life Building, Rockefeller Center, New York, NY 10020. (212) 484-1184.

Home Theater Network (TN): G and PG films, one or two new films per week. Distributed by Diversified Communications (Westinghouse has agreed to phased takeover from D.C., will stop operations June 30, 1982.) Begins 8 p.m. Mon. through Sat.; feature-film length. Operator pays $2, assuming monthly fee is not over $5. Satcom III, tr. 21. 465 Congress Street, Portland, ME 04101. (207) 774-0300.

HTN Plus: Similar to HTN but on new transponder. G, PG films, travel, and other family programming. 4 p.m. to 4 a.m. daily. Suggested retail rate $6.95; rate to operator not available. Began March 1, 1982. Satcom III, tr.16. (See HTN.)

The Movie Channel: 24-hour movie channel, distributed by Warner-Amex Satellite Entertainment Corporation. Operator pays $3.75 per subscriber per month. Satcom III, tr. 5. 1211 Avenue of the Americas, New York, NY 10036. (212) 944-4250.

Private Screenings: R-rated films distributed by Satori Productions. 12 midnight to 3 a.m. nightly. Operator pays $1.27. Temporarily off satellite; was on Westar III. 330 West 42nd Street, New York, NY 10036. (212) 563-2323.

Showtime: 24-hour movie channel, with original series and specials organized in "umbrella" concept. Showtime is a joint venture of Viacom and Teleprompter. Operator pays 50 percent of subscriber fee; discounts for volume. Satcom I, tr. 10, 12. 1211 Avenue of the Americas, New York, NY 10036. (212) 880-6633.

Spotlight: First-run movies and specials, 24 hours daily. Comstar D2, tr. 12. Distributed by Times-Mirror Satellite Programming, 2951 28th Street, Suite 2000, Santa Monica, CA 90405. (213) 450-6488.

Future Premium Services

The Disney Channel: Taken from the Group W/Disney library of movies, cartoons, and specials. Westar V. Expected winter 1983.

The Entertainment Channel (RCTV): Upscale specials, series, drama, comedy, and films drawn from BBC, other European and American sources. 7 hours weekdays, 9 hours day/weekends. Price not available. Westar III, tr. 7. Expected spring 1982. 30 Rockefeller Plaza, New York, NY 10112. (212) 757-2007.

Eros: "Erotic only" adult programming. Midnight to 5 a.m., 6 days per week. Expected April 1982.

Penthouse Network: Penthouse's adult programming channel. 12 hours daily. Expected April 1982. Operator pays $4 plus percentage of any subscriber rate over $10. Westar III. Distributed by TeleMine Corp., 888 Seventh Avenue, New York, NY 10106. (212) 489-7231.

Superstations

WGN-TV Chicago: Chicago White Sox, Cubs, and other sports; old and recent films. 24 hours daily. 10 cents per subscriber. Advertising. Satcom III, tr. 3. Distributed by United Video, 5200 S. Harvard, Tulsa, OK 74135. (918) 749-8811.

WOR-TV New York: New York Mets, Rangers, Islanders, Knicks, and Cosmos; also movies. 24 hours daily. 10 cents per subscriber full-time, 2 cents part-time. Advertising. Satcom III, tr. 17. Distributed by Eastern Microwave, P.O. Box 4972, Syracuse, NY 13221. (315) 455-5955.

WTBS Atlanta: The first superstation. 40 movies per week, sports, variety. 24 hours daily. 10 cents per subscriber full-time, 2 cents part-time. Advertising. Satcom III, tr. 6. Distributed by Southern Satellite Systems, 1050 Techwood Drive, NW, Atlanta, GA 30318. (404) 898-8500.

Appendix 3

Glossary Of Cable Terms

By
Lonni Moffet

Appendix 3: Glossary of Cable Terms

A or AA Cable—A coaxial cable that carries video and audio signals from the cable company's headend to the subscriber's home. "A" refers to a single subscriber cable and "AA" refers to a dual subscriber cable system. (See also *"B" cable.*)

Access—Programming, channels: Programming or channels available on a cable system that are controlled by the community rather than the cable operator and that generally carry noncommercial information. Usually offered free of charge to nonprofit entities and available on a nondiscriminatory basis. Profit-oriented users may utilize *leased access channels* with charges for use of studios and cable channels.

Access support—Staff, equipment, training, and promotional activities provided by the cable operator, designed to accommodate and encourage access program production.

Activated channel—A channel on a cable system that is technically equipped to carry video programming.

Addressability, addressable converters—The capability of sending video, audio, and/or data signals *downstream* from the headend to specific locations or "addresses" on the cable system. Defined by a subscriber's residence, or other drop site, this service requires an addressable converter. (See *converter.*)

Adjacent channel—Two channels next to one another on the spectrum. Video channels are 6 MHz wide; FM channels are 400 to 600 kHz wide.

Aerial plant—Within a cable system, coaxial cable that is installed above ground, utilizing leased space on utility poles. Compare to *buried* or underground plant.

Alphanumeric keyboard—Letters and numbers on a keyboard similar to a typewriter, allowing text information to be input and displayed on a video screen and/or transmitted to a computer, often used with a *character generator* for programming automated channels on a cable system.

Amplifier—A device that boosts the strength, power, voltage, or current of an electronic signal. In a cable system, amplifiers are spaced in *cascade*, at regular intervals, to allow equally strong signals to reach all portions of the plant.

Amplitude—Measure of an electronic signal, defining power range.

Analog—A form of transmission using a continuously variable signal. Compare to *digital.*

Antenna—An electronic device used for both reception and transmission of broadcast signals.

Antisiphoning—FCC rules to prevent cable systems from unauthorized use of scrambled programming such as pay TV or subscription TV (STV) signals.

Application fee—Monies charged to cable companies when applying for a franchise or license in a community. City uses this fee to defray the expenses of the franchise process.

Ascertainment—A survey of community members to determine concerns, needs, and interests, especially in regard to television, radio, and cable programming. Television broadcasters are required by the FCC to conduct regular ascertainments.

Attenuation—A weakening in the strength of a video signal.

Automated channel/programming—Information displayed on a channel in an alphanumeric or graphic format utilizing a *character generator.* Typical types of information include news, weather, program guides, bulletin boards, and consumer assistance.

Award fee—A fee charged by a franchising authority to winning applicant, usually used to cover the costs of franchising process.

Bandwidth—A Measure of the frequency spectrum usually measured in kHz or MHz. Each type of signal requires a particular bandwidth to carry information.

Basic cable service—Cable television service included in one monthly charge. May be divided into *tiers*, or levels of service, including local broadcast signals, *automated*, *satellite*, and *local programming* services. Excludes optional services such as *pay-per-channel* or *pay-per-view.*

"B" cable—A coaxial cable that carries video and audio signals for service to institutions rather than home subscribers. Also called an *institutional network.* A "B" cable is

separated from the *subscriber network*, but the two are usually interconnected.

Branch cable—A cable leading from the primary, or *trunk* cable, which distributes signals to cable drops at subscribers' homes. (See also *feeder cable*.)

Bridging or **bridging amplifiers**—An *amplifier* located at an intersection of the *trunk* and one or more *feeder cables*, boosting the signal.

Broadband—A general term used to describe a communication system which carries a wide frequency range, allowing a large number of simultaneous transmissions. Examples include *cable TV*, *satellite*, and *microwave relay systems*. Compare to *narrowband*.

Broadcaster's service area—The geographical area covered by a particular broadcast station, which is defined by the strength of a station's signal (See *Grade A contour* and *Grade B contour*.)

Broadcasting—The multidirectional transmission of electromagnetic signals. Includes television and radio.

Broadcasting/satellite service—Radio and/or television signals transmitted or retransmitted by satellites or space stations. These signals are intended for direct reception to individuals or communities.

Buried plant—Within a cable system, coaxial cable that is installed underground along public easements. Compare to *aerial plant*. (See also *underground plant*.)

Cable TV—Also known as Community Antenna Television (CATV). Utilizing a master distribution center (a *headend*), television programming is distributed via coaxial cable to residents who subscribe within a community. Programming can include broadcast signals, satellite services, and local programs originated by community members (see *access*) or the cable operator (see *local origination*).

Cable television channel—In a cable television system, the frequency or path in a coaxial cable used to transmit programming signals.

Cablecasting—The distribution of programming over a cable system, as opposed to over-the-air waves. Compare to *broadcasting*.

Carriage—Signal carriage. Transmission of television stations' signals over a cable system.

Carrier—The electromagnetic wave signal transmitted over the air or by cable at a specified frequency possessing the ability to carry information. For example, a television signal includes a video carrier and an audio carrier within the 6 MHz channel bandwidth.

Cascade—A sequence of *amplifiers* in a cable system plant in which the output of one amplifier acts as the input of the next.

Cassette—A self-contained package of videotape or audio tape capable of recording and playing electromagnetic signals.

Channel—The transmission path or portion of the electromagnetic spectrum utilized to carry a signal.

Channel capacity—The maximum number of 6 MHz channels that can be simultaneously carried on a cable system.

Character generator (CG)—An electromagnetic device that uses an *alphanumeric keyboard* to display letters and numbers on a television screen. Used for *automated programming* or along with other video programming.

Closed-circuit television (CCTV)—A communications system with reception available only to limited locations. Transmitted via cable, microwave relay, or telephone lines, CCTV is found most often in institutional or commercial settings.

Coaxial cable—The transmission wire used in a cable system to carry television, audio, and data signals. Coaxial cable consists of two concentric conductive wires separated and covered by insulating materials.

Co-channel interference—Distortion of television signals resulting from reception of two or more television stations that broadcast on the same channel number or frequency. The distortion appears as horizontal bars on the screen.

Common carrier—Legal definition of entity providing point-to-point communication relay service available for hire on a nondiscriminatory basis to the general public. Common carriers exert no content control over messages and are regulated by Federal and State agen-

cies. Examples include telephone companies and owners of communication satellites.

Communications Act of 1934—The major communications statute that established the Federal Communications Commission (FCC). The Act was established to "make available, so far as possible, to all the people of the United States, a rapid, efficient, nationwide and worldwide wire and radio communications service."

Community Antenna Relay Service (CARS)—The portion of the microwave frequency band (12.75 to 12.95 GHz) assigned by the FCC to relay television, FM radio, cablecasting, and other signals to a terminal for distribution over cable systems.

CATV (Community Antenna Television Systems)—Widely used acronym for what is now called *cable television*. The name originated from the community use of one large antenna for reception of TV signals which were then distributed over cable to residents.

Compulsory license—A legal requirement mandating copyright holders to license users of copyrighted material (such as cable operators) on a uniform basis and for a stipulated fee.

Conductor—Material capable of carrying an electric current. Examples include wire and *coaxial cable*.

Conduit—Material such as thin metal or plastic pipe that protects wire or cable.

Contour—The predicted geographical coverage area of a broadcast station.

Contrast—The range of light and dark values in a picture, usually expressed as the ratio between the maximum and minimum brightness values.

Converter—At the cable headend, a converter changes the frequency of television signals to protect them from strong local interference. At a subscriber's home, a set-top converter inputs signals from the cable into the television receiver. Stations are selected by utilizing buttons or a dial on the converter itself.

Cooperative ownership—User-owned and controlled service, such as cable television, whereby policies are set by subscribers.

Copyright—Exclusive legal rights to publish, produce, sell, or distribute literary, theatrical, artistic, or musical works.

Cross-modulation—A form of signal distortion in which modulation from one or more RF carrier(s) is imposed on another carrier.

Cross-ownership—Legal term for ownership of two or more kinds of communication outlets (radio, TV, newspaper) by the same individual or company. The FCC prohibits companies from owning certain combinations of media within given markets to avoid monopoly situations.

Decoder—Device that translates electronic signals into a form that allows recovery of original message. Compare to *encoder*.

Dedicated channel—A channel on a cable system designated for use by a particular group or for a specific purpose or type of programming. Examples include public access, educational use, or business data.

Demodulator—A device which converts radio frequencies back into audio and video signals. See also *modem*. Compare to *modulator*.

Descrambler—A device used to convert purposely scrambled signals back to usable format. Signals are electronically scrambled to prevent unauthorized use. See also *pay TV*, *subscription TV*, *scramble*.

Digital—A form of transmission using pulses of discrete or discontinuous signals. Compare to *analog*.

(DBS) Direct broadcast satellite—DBS—A system to distribute high-power satellite signals directly to a receiving dish at a subscriber's home rather than over cable or some other intermediary redistribution technology.

Direct pickup—Unwanted reception of a broadcast signal over a television receiver that is hooked up to a cable system. This reception causes distortion and is prevented by using proper shielding or a converter.

Discrete address—Point-to-point transmission as opposed to transmission from a point to multiple points. Compare to *multiple address*.

Distant signals—A relative term describing television signals beyond the range of ordinary home reception equipment. The FCC formerly imposed restrictions upon cable operators'

carriage of distant signals as a measure to protect local broadcasters.

Distribution plant—A collective term for the hardware of a cable system which is used to distribute signals from the headend to subscribers. Equipment includes *amplifiers*, *trunk cable*, and *feeder lines*.

Domsat—An abbreviation for domestic satellite.

Downlink—A satellite receiving station. Compare to *uplink*.

Downstream—Term used to describe the direction of signals in a cable system traveling from the cable *headend* to the subscriber's home. Compare to *upstream*.

Drop or cable drop—The cable that connects to a subscriber's home from the *feeder cable*, allowing reception of signals.

Dual cable—Two cables installed side by side in a cable system.

Earth stations—Dish-shaped electronic devices equipped to receive and process video, audio, and data communications via satellite. (See also *downlink*.)

Echo—A "ghost" image in a television picture caused by signal reflection or return of a strong magnitude. (See also *interference*.)

Education access channel—A channel on a cable system which is designated for exclusive use by educational entities.

Educational television station—A noncommercial television station with programming including instruction. Often used to describe "public broadcasting" stations, which also include educational, cultural, children's, and news programming.

Electromagnetic Spectrum—The range of electromagnetic energy (oscillating electrical and magnetic energy that can travel through space). Differing wave frequencies are allocated to different types of communication services including television and radio.

Emergency alert override system—A broadcast system designed to interrupt all channels of a system with an emergency audio and/or video message.

Encoder—An electronic device that codes signals into a form so they may transmitted. Compare to *decoder*.

Exclusivity—The provision in a commercial television film contract that grants exclusive playback rights for the film or episode to a broadcast station in the market it serves.

Facsimile transmission—The electronic transmission of textual and/or graphic information via radio, telephone, telegraphy, or telephone. Receivers get a reconverted copy of the original. With special facsimile equipment, a home or business television receiver may be able to receive mail, newspapers, and data via cable.

Feeder line or feeder cable—Also known as *branch cable*, this is the cable leading from the *trunk cable* which then leads to cable drops at the subscriber's home, allowing distribution of signals.

Fiber optics—Utilizing long and very thin glass fibers, modulated light signals can carry information such as data or television signals. The advantages of fiber optics include decreased distortion and attenuation and high channel capacity (up to 1,000 television signals in a single glass fiber). Transmission over fiber optics requires less energy than does cable.

Field—One-half of the information in a video *frame*, composed of every other line of information on a television receiver scanned at intervals of 1/60 of a second.

Filter—A circuit within a cable distribution plant that allows passage of desired channels and blocks others. Filters are used in *trunk* and feeder lines for distribution of different packages of service, including tier structures, pay cable services, FM services, and/or two-way operations.

Fixed satellite service—Telecommunications service between specified, fixed-earth stations utilizing one or more satellites for transmission.

FM service—cable radio—Within a cable system, an audio service provided to subscribers by attaching a cable to an FM receiver. FM/audio services can include FM stations; satellite audio services; simulcasting of broadcast, satellite, or pay services; and special services for the visually impaired such as "Talking Books."

400 MHz technology—Equipment that can accommodate frequencies from 5 to 400 MHz within cable systems due to advances in amplifier performance. Allows up to 54 channels on a single cable.

Footprint—Term used to describe the geographical coverage area of a satellite's transmission.

Format (tape format, video format)—Refers to (a) width of videotape used by a video cassette recorder, or (b) the recording process used, as in BETA or VHS recording systems. Machines using different formats are incompatible.

Frame—A complete television picture, composed of two *fields* of electronic information; a frame lasts 1/30 of a second and consists of all 525 lines of information composing a video image.

Frame grabber—A device allowing a viewer control such that a single frame in a television picture or textual display can be held and viewed as a still image.

Franchise or license—A contractual agreement between a cable operator and a government authority authorizing the operator to build and operate a cable system within a given geographical area.

Franchise fee—Annual fee collected from cable operator by franchising authority. Generally based on 2 to 5 percent of cable operator's gross revenues, this fee is used to cover the costs of use of public easements and may be used for other cable-related activities and expenses. The FCC currently limits the allowable franchise fee to 3 percent of gross revenues, or 5 percent with special permission.

Franchising authority—The government body responsible for specifying the terms of a franchise agreement, awarding the franchise, and regulating the operation of cable service within its jurisdiction. May be a city, county, or State regulatory authority.

Frequency—A measure of the number of times an electromagnetic signal repeats an identical cycle within a unit of time. One hertz (Hz) is one cycle per second. A kilohertz (kHz) is 1,000 cycles per second, a megahertz (MHz) is one million cycles per second, and a gigahertz (GHz) is one billion cycles per second.

Full network station (Network Affiliate)—A local commercial television broadcast station that carries approximately 85 percent of the hours of of programming offered by one of the three major national networks (ABC, CBS, NBC) during its weekly prime time hours.

Geostationary (geosynchronous) satellite—A communications satellite orbiting at the same speed as the earth's rotation, thus appearing to be stationary.

"Ghosting"—Distortion of television signals caused by mountains, buildings, or airplanes. (See also *interference*.)

Gigahertz (GHz)—A measure of frequency indicating one billion cycles per second.

Grade A contour—The geographical reception area of a broadcast station in which a good picture is estimated to be available 90 percent of the time at 70 percent of the receiver locations. See also broadcaster's serivce area.

Grade B contour—(Larger than and encompassing the *grade A contour*.) The geographical reception area of a broadcast station in which a good picture is estimated to be available 90 percent of the time to 50 percent of the receiver locations.

Grandfathering/grandfather clause—Legally, the exemption from regulatory or legislative enactments due to entity's existence or operation prior to activation of rule.

Gross Receipts—All revenue derived from or attributable to a given corporation or subsidiary.

Hardware—Equipment involved in production, storage, distribution, and reception of electronic signals. In cable, this includes the *headend*, *cable distribution plant*, *amplifiers*, television receivers, *antennas*, and *origination equipment*.

Headend—The electronic control center of a cable system generally located at the main antenna site. Hardware includes *frequency converters*, *demodulators*, *modulators*, *amplifiers*, and *origination equipment*, all of which process signals for distribution over the cable system.

Hertz—A measure of frequency equivalent to one cycle per second.

House drop—See *drop*.

Hub—A location in a cable distribution system that serves as a *mini-headend* by distributing signals from the main *trunk* cable to *feeder* cables.

Hubnetwork—A cable system design in which signals are transmitted from the main headend to distribution centers (*hubs*), where signals are retransmitted through feeder lines to subscribers' homes. Compare to *tree network*.

Independent station—A commercial television station not affiliated with one of the major national networks.

Infomercials—Advertising formatted to resemble regular television programming.

Initial service area—The initial area in a community to be wired for cable service.

Institutional network—A separate or integrated cable network whose capacity is dedicated for use by institutions such as schools, hospitals, government, and business.

Instructional Television Fixed Service (ITFS)—A *closed-circuit* educational broadcasting system that distributes programming via a special, FCC-designated microwave band to fixed locations.

Interactive service—In a cable system, the capability of sending audio, video, and/or data signals downstream from the headend to the subscriber and also back upstream again. Usually requires a computer at the headend and an "intelligent" interactive converter at the subscriber's home. Examples of uses include opinion polling, requests for pay-per-view, information retrieval, and video games. (See also *two-way capacity*.)

Interchangeability—The ability to substitute one manufacturer's equipment for another's without modification.

Interconnect—A microwave, satellite, fiber optic, or coaxial cable distribution system between two or more cable plants that allows mutual distribution of programming.

Interference—Distortion of television signals caused by unwanted reception of another signal.

Intermodulation distortion—Form of interference involving the generation of interfering beats between two or more TV signal carriers.

Keyboard—See *alphanumeric keyboard*.

Kilohertz (kHz)—1,000 *hertz* or cycles per second.

Leapfrogging—Term to describe the practice by cable operators of not carrying or skipping over one or more of the local TV stations to bring in more distant signals. FCC rules protect local broadcasters with the "must-carry" rules.

Leaseback—The practice of installing and maintaining cable distribution system and of "leasing" the facilities "back" to separate contractors for operation of the system.

Leased access channels—A channel or channels available on a cable system for lease to a separate program provider.

Line extension area—Area outside the *initial service area* of a cable system where service will be provided after the area reaches a certain housing density.

Local distribution system (LDS)—A broadband microwave system capable of transporting a number of television signals simultaneously. Used to interconnect cable system headends using *CARS microwave* frequencies.

Local government access channel—A channel on a cable system dedicated for use by local government and municipal entities.

Local loop service—A local information distribution service, using either phone lines, cable, or other technologies, which allows intrabuilding or interbuilding communication, usually between business machines.

Local origination—Video programming produced by the local cable operator and/or programming obtained by the operator (excluding programming from satellites) that is offered as a part of basic cable service.

Local programming—A collective term for all programming on a cable system that is originated locally. May include *local origination* as well as *access programming*.

Local signals—Television signals received at locations within a location's *Grade B contour*. Cable systems must carry all local television signals.

Lockout device—A mechanism designed to prevent the reception of specific programs as desired by the subscriber. Usually used to prevent reception of R-rated pay cable movies.

Low power TV station—A television station or translator with low transmitting power that originates television programming. Compare to *television translator station*.

Mandatory carriage ("must-carries")—Local broadcast signals that cable systems are required by the FCC to carry. All "must-carries" are required to be available on the same *tier* of service.

MATV (master antenna television system)—A master antenna used to pick up television

signals for distribution over coaxial cable to a closed concentration of television sets, as in an apartment building or hotel.

Maxi-pay—Full service pay TV programming from 8 to 24 hours daily. (See *pay cable*.)

Megahertz—A measure of frequency at one million cycles (or hertz) per second.

Microwave—The segment of the electromagnetic spectrum of frequencies above 1,000 megahertz. This section is reserved for point-to-point transmission of signals. Microwave systems require line-of-sight transmission paths. (See also *microwave link*.)

Microwave link—A relay station for amplification and retransmission of microwave signals.

Midband—The part of the electromagnetic spectrum that lies between television channels 6 and 7, reserved by the FCC for aeronautical, maritime, and land mobile radio. These frequencies can also be used on cable systems but require converters for reception on home TV sets.

Mini-pay—Pay programming available for a limited number of hours per day. Mini-pay rates are approximately half those of maxi-pay rates. (See also *paycable* and *maxi-pay*.)

Minority ownership—Refers to ownership and operation of a cable system by members of a recognized ethnic, racial, religious, or other minority group.

Modem—A modulating/demodulating device used to process electronic signals for transmission. For example, a telephone modem translates signals from a home computer for transmission over a telephone line to another computer. (See also *modulator, demodulator*.)

Modulator—A device that converts audio and video signals into radio frequencies to allow them to be transmitted electronically. Compare to *demodulator*.

Monitor—A video display unit, similar to a television receiver, allowing viewing of video programming either from a tape source or directly from a TV camera. May be a modified television receiver; however, a simple monitor has no radio frequency tuning abilities.

Multiple address—Transmission from a single point to a multiple number of locations or specified points. (See also *discrete address*.)

Multipoint distribution service (MDS)—A common carrier, microwave service for one-way transmission of programming to fixed, designated points within a limited line-of-sight geographical area. One common use is for delivery of *pay TV* programming to hotels and apartment buildings.

Multiple system operator (MSO)—Term used to describe cable companies that operate more than one cable system.

Municipal ownership—Ownership and operation of a cable system by a local government body.

Must-carry—Local broadcast signals that are required to be carried over the cable system by the FCC.

Narrowband—A communications system that has a narrow frequency range. A narrowband system cannot transmit video programming. Compare to *broadband*.

Narrowcasting—The transmission of programming to a selected audience that may be defined by intracity communications, schools, businesses, or special interests. Compare to *broadcasting*.

The National Television Systems Committee (NTSC)—Created by the FCC in 1951 to determine the optimum system and standards for color television to insure satisfactory color rendition and compatibility with black and white standards. In 1953, this committee's findings were submitted to the FCC and became the basis for present standards in broadcast television.

Net Weekly Circulation (NWC)—An estimate of the number of television households viewing a particular station at least once during a week, Monday through Sunday, 6 a.m. to 2 a.m. This figure is used to determine whether a station is "significantly viewed" in an area and, therefore, must be carried by a cable system operating in that area.

Network—Generally used to refer to a group of affiliated radio or television outlets linked by cable, satellite, or microwave which by contractual agreement transmit identical programs simultaneously.

Network nonduplication—Describes an FCC regulation requiring a cable company to protect

local broadcasters by disallowing simultaneous carriage of distant stations duplicating programming available on local stations.

Noise—Accidental transmission of electronic impulses that disrupt picture quality. See also *interference*.

Nonprofit access corporation—A corporation formed exclusively for the purpose of facilitating program production on access channels on a cable system. May be responsible for setting policies, administering grants, and/or promoting use of access facilities.

Optical fiber—See *fiber optics*.

Ordinance—In cable, a local law that governs the institution and operation of a cable television system in a community. An enabling ordinance establishes procedures for the franchise process. A granting ordinance is the actual franchise setting up the contractual relationship between the cable operator and the municipality.

Origination programming—Programming on a cable system exclusive of broadcast signals, and pay TV, subject to the exclusive control of the cable operator. See also *local origination*.

Overlapping markets—A case where a TV station's grade B contour is overlapped by the grade B contour of a TV station located in another market.

Over-the-air—Reception of TV signals which have been broadcast through the air waves.

Pay cable—Programming offered on a cable system with fees assessed above and beyond basic cable charges. Fees may be levied either on a per-channel basis or on a per-view or program basis. (See also *pay-per-view*, *premium services* , *maxi-pay*, *mini-pay*.)

Pay TV—A system of television in which viewers pay directly for programming not available on advertiser-supported TV. Electronically scrambled signals are distributed and descrambled for the homeowner's set with a decoder. Subscribers either on a per channel-basis, in which a monthly charge covers all programming distributed on the channel, or per program, in which services are activated upon request and charges are assessed for a particular program. Pay TV can be distributed over cable systems (see *pay cable*), over-the-air (see *STV*), or via microwave or master antenna systems (see *MDS* and *MATV*). (See also *premium services*, *pay-per-view*.)

Pay-per-view/pay-per-program—Pay programming for which charges are assessed by the individual program requested. In a cable system, either an *addressable* or *interactive converter* is required to allow programming to be received on a pay-per-view basis. (See also *pay cable*, *pay TV*.)

Penetration—A ratio of the number of cable subscribers to the total number of households passed by the system; in other words, the percentage of households subscribing to the service.

Performance standards—The minimum technical criteria that a cable system must meet as defined by the FCC and/or a local ordinance.

Pirating—In communications, the illegal tapping of pay TV or cable TV signal transmission.

Plant—In cable, the *hardware*, *buildings*, and *distribution system* of a system.

Point of origination—A studio or hub point at which a program is first introduced into the distribution system.

Pole attachment—Use of utility poles and lines by cable systems. Contractual agreements must be negotiated between the power companies and the cable operator at reasonable terms as defined by a local ordinance.

Polling/opinion polling—Using an interactive converter, the process whereby a cable subscriber may register a response to a request or a question put forth on a cable program.

Porta-pak/portable video unit—A battery-operated video sound camera and video recorder which is lightweight, and used for remote production. Can include other production equipment such as microphones and lights.

Premium services—On a cable system, refers to optional services that have charges above and beyond that for basic cable services. Can include *pay cable*, video games, text and/or interactive services.

Prime time—The times of the day which have the largest audience for TV or radio programming and on which the commercial broadcaster usually charges the highest rates for adver-

tising time.

Program nonduplication—See *network nonduplication.*

Public access channel—A channel on a cable system designated for use by the general public or nonprofit entities within a community on a nondiscriminatory basis usually with no charges for channel time. (See *access.*)

Push-pull amplifier—An electronic amplifier that improves a cable system's performance by connecting identical signal paths in such a way that the electronic processing of the signal is balanced and distortion is reduced.

Receiver (demodulator)—The electronic device that reconverts electromagnetic waves back into audio and video signals. In TV, this is the television set.

Redundant cable—Cable in a cable system that is held as reserved for backup or future use. (See also *"AA" cable.*)

Regional channel—A channel dedicated for regional programming usually involving interconnected cable systems. (See also *interconnect.*)

Rent-a-citizen—Slang term used to describe influential local citizens who have been given ownership positions in a cable company for the purpose of exerting influence over the eventual award of a franchise. May involve low-cost or no-cost stock distribution or the practice of putting prominent community members on a company payroll as local consultants.

Request for Proposals (RFP)—Document issued by a local franchising authority that outlines format of bids, deadlines, minimum requirements, and general guidelines for potential applicants in a cable franchising process.

Retrofitting—Modification of an original cable plant to increase channel capacity or to provide additional services such as interactive capability.

Satellite—An orbiting space station that can receive and transmit audio, video, and data signals from uplink stations, which are then transmitted back to earth and received by *earth stations.*

Scramble/scrambled signal/scrambler—Using an electronic device, the process of breaking up an electronic audio/video signal into its component parts, thus requiring a special decoder for descrambling and receiving the proper signal. Generally used to prevent unauthorized reception of *pay TV* signals. Compare to *descramble.*

Security system—General term used to describe a home security system offered by a cable operator. May include smoke detectors, burglary detection devices, and medical alert buttons, which, if activated or tripped, send a signal to the cable headend or other monitoring location, which can alert the appropriate authorities.

Service level security—Electronic design of a cable system that insures that subscribers receive only the levels of services to which they are entitled. (See also *tier.*)

Shop at home—Describes cable programming that features retail merchandise on systems that provide some mechanism for ordering products. This may be simply via telephone; in more sophisticated systems, subscribers use an interactive converter for ordering and automatic billing.

Signal—The electronic impulses that compose an electronic message, to be transmitted over the air or over some other communications medium such as cable or telephone.

Signal carriage rules—FCC regulations that define what signals shall be be carried or deleted on cable systems. (See *"Must-carry," Network nonduplication.)*

Signal-to-echo ratio—The ratio of desired signal strength to the level of echoes that are time-displaced (that is, they appear on the television receiver to be to the right or left of the desired signal by a perceptible amount). Echoes appear in television pictures as "ghosts." The signal-to-echo ratio is a measure of cable system electronic performance. (See also *interference.*)

Signal-to-hum modulation ratio—The ratio of desired signal strength to undesired hum modulation level in the signal. Hum modulation is a form of signal distortion introduced by the electronics in a television transmitter or a cable system and is perceived in a television picture as one or more sets of horizontal light and dark bars. It is sometimes a result of malfunction in the television receiver. Signal-to-hum modulation is a measure of signal

transmission performance in television broadcasting and cable television distribution.

Signal-to-noise ratio—The ratio of desired signal strength (especially television signals) to undesired noise level present in the signal. A signal-to-noise ratio is an expression of how much objectionable noise is present in a television picture.

Slow-scan television—Television transmission of images at a slow rate, using narrowband transmission such as telephone lines or other communications media with a limited information-carrying capacity. (See also *narrowband.*)

Software—Refers to both materials used in programming such as films, slides, videotapes, or video discs, and the information they carry. Also used to refer to languages and formats used in computer programming. Compare to *hardware.*

Special effects generator (SEG)—A device that combines video inputs and produces "effects" such as fades, split-screen images, or titles over pictures.

Specialty Station—As defined by the FCC, a broadcast station carrying programming that caters to a specific audience, such as foreign language or religious programming, at least one-third of its broadcast time.

Splitter—A passive device that has no electronic components and distributes a television signal carried on a cable in two or more paths.

Sports blackout—Regulations requiring broadcasters and cable systems to delete coverage of local sports events, a practice designed to protect gate receipts.

Sub band—The portion of the frequency band (5 MHz to 54 MHz) that may be used for two-way data transmission or upstream video signals on a two-way cable system.

Subcarrier—A carrier of signals imposed upon another carrier such as a 6 MHz channel. The color information of a television picture signal is modulated onto a subcarrier at 3.58 MHz higher in frequency than the video carrier.

Subscriber—Households hooked up to a cable system, who usually must pay an initial installation fee and regular monthly charges for *basic cable services.*

Subscription Television (STV)—A form of pay television service delivered to subscribers via *MDS* or *over-the-air* methods. *Scrambled* signals are broadcase, and subscribers are given special *decoders* for reception of pay programming. (See also *Pay TV.*)

Superstations—Broadcast stations whose signals are transmitted over satellites and thus are available nationwide for distribution over cable systems. Examples include WGN—Chicago, WTBS—Atlanta, and WOR—New York.

Synchronous satellite—A *geostationary* satellite.

System, cable—Refers to the collection of hardware equipment and facilities designed and constructed to the purpose of producing, receiving, amplifying, and distributing audio, video, and data transmissions via coaxial cable to subscribers in a particular geographical area.

Teleconferencing—Simultaneous visual and/or audio hookups between individuals in two or more areas allowing a "conference" effect. Usually signals are transmitted over satellite or phone lines.

Teletext—One-way alphanumeric information service usually inserted into the *vertical blanking interval* of a video signal distributed over broadcast television or cablecast.

Television channel—A portion of the frequency spectrum dedicated to carry audio and video television signals. In the United States, television transmission requires 6 MHz of bandwidth.

Television translator station—Equipment that receives, boosts, and retransmits television signals via low-powered TV or FM frequencies into geographical locations that have difficulty receiving TV stations. Translator stations are restricted by the FCC from originating programming. Compare to *low power TV station.*

Terminal—Generally a connection point for transmitted signals. In cable systems, a *converter* acts as a terminal.

Tier/tiering/tiered service—The practice of offering multiple levels of basic service to cable subscribers. Usually progressive in price and quantity of services. Compare to *basic cable service.*

Tier separation or isolation—A technical way of dividing tiers of service so that subscribers

receive only the levels of service they pay for.

Top 100 market (or major market)—Refers to the 100 largest television markets, as determined by population and number of television households.

Translators—See *television translator station*.

Transmission—Active sending of information in the form of electronic signals from one point to another or many points.

Transponder—A device or "address" on a satellite capable of receiving and retransmitting audio, video, and data signals.

Tree network—Cable system design configuration in which one *trunk* cable distributes signals to *feeder* cables in a continuous path. Compare to *hub network*.

Triple-beat noise—A form of intermodulation distortion in the form of beats or streaks that result from the interaction of a large number of signal carriers on cable system with 30 or more channels.

Trunk line/trunk cable—In a cable system, the main cable from the *headend* used for signal distribution.

Turn-key—Refers to a subcontracter who performs a job in cable, usually used in context of cable system construction.

Two-way capacity—In a cable system, the ability to carry signals both downstream from the headend to the subscriber, and upstream from the subscriber to the headend. (See also *interactive service*.)

UHF channels—Television channels carried on the ultra high frequency part of the spectrum. On a conventional television, channels 14 through 83 (300 to 3,000 MHz).

Underground installation/plant—The practice of installing the cable system underground rather than aerial suspension on utility poles. Usually this is done in areas where utilities are underground as well. Compare to *aerial plant*. (See also *buried plant*.)

Uplink—An earth station capable of transmitting signals to a satellite. Compare to *downlink*.

Upstream—In a cable system, signals traveling from the subscriber to the headend. Compare to *downstream*. (See also *two-way capacity*.)

Vertical blanking interval (VBI)—The portion of the television signal that generally carries electronic signal control information for reception of the picture. Unused lines can be used to carry *teletext* information.

VHF channels—Television channels carried on the very high frequency portion of the spectrum, channels 2 through 12 (30 to 300 MHz).

Video—An electronic technology that converts aural and visual information into electronic signals, using light-sensitive picture tubes within a camera, microphones, and a magnetic recording process.

Video cassette recorder (VCR)—A machine capable of recording and playback of video signals encoded on videotape encased in a plastic cassette. VCR's are usually described in terms of their *format*. VCR's must be connected with a *monitor* or *television receiver* for viewing. (See also *VTR*, *videotape*.)

Video discs—A phonographic-like disc containing encoded video images and sound. These are played back on a video disc player utilizing either laser technology or a capacitator (needle).

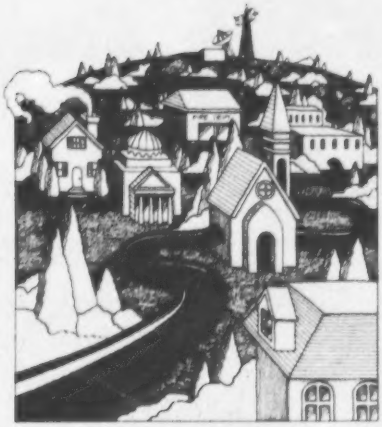
Videotape—The plastic, magnetic tape used for recording video and audio signals. May be in cassette or open reel *format* and is available in varied widths, depending on the recording technology.

Video signal—The electronic signal before it is modulated and converted to radio frequency for broadcast or cablecast. A television receiver reconverts radio frequencies to a video signal.

Video tape recorder (VTR)—A machine that records video signals onto magnetic videotape, by remagnetizing the chemical coating on the tape to create certain signal patterns that can be "read" by the machine, allowing playback. (See also *VCR*.)

Videotex—Alphanumeric information distributed electronically usually over telephone. Videotex is a *two-way* information technology whereby a user can request specific data from a master computer data base. Compare to *teletext*.

Appendix 4



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Video News. Phillips Publishing Co., Inc. 7315 Wisconsin Ave., Washington, DC 20014 (biweekly). $147.

Video Publisher. Knowledge Industry Publications, Inc., 2 Corporate Park Drive, White Plains, NY 10604 (biweekly).

Weekly TV Digest with Consumer Electronics. TV Digest, Inc., 1836 Jefferson Place, N.W., Washington, DC 20036 (weekly). $253.00.

Monthly, Quarterly, etc.

CATJ (Community Antenna Television Journal). Community Antenna Television Association, 4209 N.W. 23rd St., Suite 106, Oklahoma City, OK 73107 (monthly). Members, $10; nonmembers, $14.

Cable Libraries. C.S. Tepfer Publishing Co., Inc., 51 Sugar Hollow Road, Danbury, CT 06810 (monthly). $25.00.

Channels of Communication. 1515 Broadway, New York, NY 10036 (bimonthly).

Communications-Engineering Digest. (C-ED) Titsch Publishing Company, 1130 Delaware

Plaza, P.O. Box 4305, Denver, CO 80204 (monthly).

Community Television Review. National Federation of Local Cable Programmers, 3700 Far Hills Ave., Kettering, OH (quarterly).

CTIC CableReports. Cable Television Information Center, 1800 North Kent St., Arlington, VA 22209 (monthly). Nonprofit, $105; Profit, $165.

Educational and Industrial TV. C.S. Tepfer Publishing Co., Inc., 51 Sugar Hollow Road, Danbury, CT 06810 (monthly). $15.00.

Federal Communications Law Journal (formerly Federal Communications Bar Journal). UCLA School of Law/Federal Communications Bar Association, P.O. Box 57109, Washington, DC 20037 (triannual). $15.00.

Intermedia. International Institute of Communications, Tavistock House East, Tavistock Square, London WC1 9LF (bimonthly). $38.00.

International Videotex Teletext News. Arlen Comunications, Inc., P.O. Box 40871, Washington, DC 20016 (monthly). $180.00.

Journal of Broadcasting. Broadcast Education Association, Temple University, Philadelphia, PA 19122 (quarterly).

Journal of Communication. The Annenberg School of Communications, University of Pennsylvania, 3620 Walnut St., Philadelphia, PA 19104 (quarterly). $15.00.

Satguide. Commtek Publishing Company, P.O. Box 1048, Hailey, ID 83333 (monthly). $36.00.

Telecommunications Policy. IPC Business Press, Ltd., 205 E. 42nd St., New York, NY 10017 (quarterly). $104.00.

Videography. United Business Publications, Inc., 475 Park Avenue South, New York, NY 10016 (monthly). $18.00.

View The Magazine of Cable TV. 150 East 58th St., New York, NY 10155.

Viewdata/Videotex Report. Link Resources, 215 Park Ave., South, New York, NY 10003 (monthly). $295.00.

Viewtext. Information Gatekeepers, Inc., 167 Corey Road, Brookline, MA 02146 (monthly). $275.00.